A TEXT-BOOK

OF

DISEASES OF WOMEN

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THE PHILADELPHIA HOSPITALS.

With 655 Illustrations
many of them in Colors

PHILADELPHIA, NEW YORK, LONDON
W. B. SAUNDERS & COMPANY
1903

PRESS OF
W. B. SAUNDERS & COMPANY
PHILADELPHIA

PREFACE

THIS book on the diseases of women has been prepared as a companion volume to the author's "Text-book of Obstetrics," the two volumes covering the whole subject of gynecology. It is based on an experience of twenty years.

The illustrations are mainly original, for the most part from the author's service in the Howard Hospital, of Philadelphia. The others are properly credited. The micro-photographs were prepared by Drs. J. C. Hirst and McConnell. The section on anesthetics is written by Dr. B. F. Roller, the author's anesthetizer.

A special effort has been made to describe the palliative treatment of diseases of women and such curative treatment as can be carried out by the general physician. A separate section has been devoted to the detailed description of modern operative technic.

The anatomical, rather than the pathological, classification of diseases of women has been adopted, as in the author's judgment the most logical and convenient.

The aim of the work is to present a concise description of all the diseases peculiar to women, with especial attention to diagnosis and treatment, adapted to the needs of the medical student, the general physician, and the specialist.

1821 SPRUCE STREET,
September 1, 1903.

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A TEXT-BOOK

OF

DISEASES OF WOMEN

HIRST

PART I.

THE GYNECOLOGICAL EXAMINATION; LOCAL TREATMENT.

In eliciting the symptoms of a disease peculiar to women, the subjective and the objective symptoms should be investigated. The former are experienced by the woman and must be communicated by her; the latter are determined by the senses of the examining physician, usually by inspection and palpation.

The subjective symptoms are obtained by questioning the patient. Obviously, too much importance must not be attached to them. The woman may not have accurately observed her condition; she may misinterpret what she feels; she may be neurasthenic or hysterical, and therefore may exaggerate or simulate symptoms.[1] She may purposely give a false history, or she may be incapable of making a statement if she is drunk, delirious, unconscious, or insane. The subjective symptoms, however, possess a certain value, and should always be ascertained if possible. Time is saved and errors of omission are avoided by a routine series of questions in regular order. Thus, the patient's age and social state; any important diseases or accidents in her past life; a hereditary tendency to cancer or tuberculosis; the number of children or miscarriages, if any; difficulty in the labors or afterward.

Menstruation.—The age at which it first appeared; the intervals between the periods; the duration of the flow; its character and quantity. Are clots passed? Has the discharge a foul odor? Is there intermenstrual bleeding? Has the menopause occurred? If so, when; and has there been any bloody discharge since?

Leukorrhea.—If there is a mucopurulent discharge, what are its exact character and quantity? Is it constant? Has it a foul odor? Does it appear midway between the periods?

Pain is next inquired for; its situation and character; whether it is influenced by menstruation; if it is worse before, during, or after the flow. Is it affected by a sudden jolt or jar, or by coitus? Does it occur midway between the periods ("Mittelschmerz")?

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[1] One of my patients put the fur of a cat in her urine; another wrapped tresses of her own hair around the fecal masses she defecated, suggesting the communication of a dermoid cyst with the bladder and bowel.

Backache should be asked about separately: Is it worse on exertion or on first arising in the morning? Is it affected by mental effort? Is its situation the small of the back or the very end of the spine?

When the patient stands erect, is there a sense of prolapse, or lack of support? Is there an actual protrusion from the vagina?

Is there any peculiarity of defecation or urination?

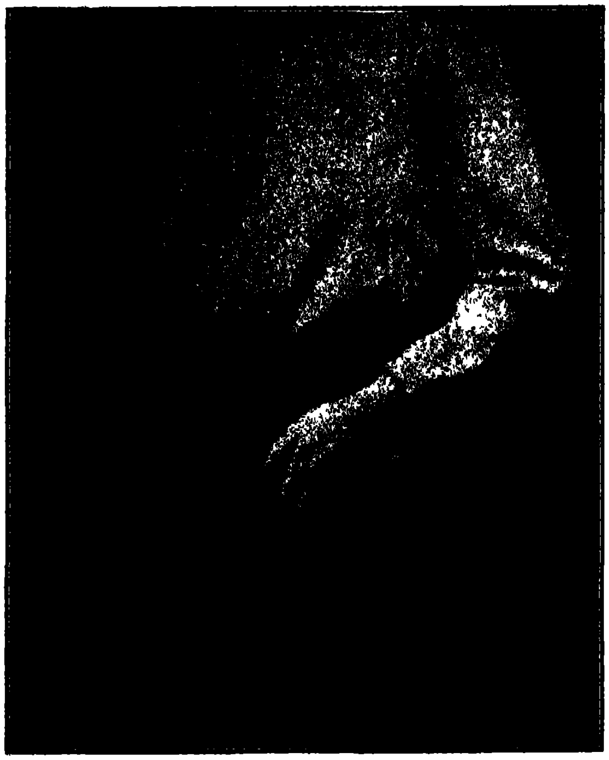

Fig. 1.—Characteristic gesture of tubo-ovarian pain.

Finally, the general health should be investigated: loss of weight, pallor, feeble circulation, headache, localized pains remote from the sexual organs; sleeplessness and nervousness must be asked about. The answers to all these questions may suggest further inquiries. It is often advisable to inquire into the sexual relations of married women, more particularly as to the means which may be taken to prevent conception.

Conclusions of a certain value may be drawn from the answers to these questions. If a woman has pain above Poupart's ligaments, worse before or after menstruation, and somewhat relieved during the flow, she probably has a tubo-ovarian inflammation, which is usually more acutely felt on the left side, even though both sides are equally affected. If there is inflammatory disease of the uterine appendages, there is usually an acute pain in consequence of a jolt or jar, as in a sneeze, and in coitus. In describing the situation of this pain the patient usually makes a characteristic gesture.

If there is backache, worse in the morning and not aggravated by exertion, there is probably a strong neurasthenic element in the case, or there may be rheumatism of the lumbar muscles. Backache only appearing on or much aggravated by exertion in the erect posture suggests retroversion of the uterus or injury of the pelvic floor. Pain in the end of the spine should arouse a suspicion of neurasthenia or hysteria, for this is a favorite seat of imaginary pain; but it may indicate coccygodynia in consequence of an injury to the bone or its joints.

It is unwise, however, to form too strong a preconceived opinion from the subjective symptoms alone. Even an experienced specialist, on making a physical examination, may occasionally imagine he finds the signs of a condition which really does not exist, if his mind has been too firmly preoccupied by the thought of some disease suggested by the patient's statements.

Objective Symptoms.—While the patient is entering the office, giving her history, and replying to the physician's questions, information of some value is obtained by an observation of her appearance and behavior. A slow, cautious gait, with the body bent forward, the hand perhaps resting on the abdomen, an evident care to avoid a jolt or jar, and an apprehensive expression on the face are indicative of pelvic peritonitis or peritoneal irritation. The cachexia of cancer, the intense pallor of anemia from metrorrhagia, the greenish-yellow skin of chlorosis, the sallow complexion of sepsis, the evidence of malnutrition in the *facies ovariana*, the shifty glance and twitching eyelids of hysteria are all suggestive and should be noted. There are lines of care upon the face and a prematurely aged look in many a case of uterine displacement. The cosmetic effect of a uterine suspension, for example, is often very striking. The most valuable objective symptoms, however, are appreciable by the sense of touch.

Palpation of the pelvic organs in women is most often practised by a digital examination of the vagina, assisted by counterpressure upon the lower abdomen (*combined vaginal and abdominal examination; bimanual examination*). The patient is usually placed upon her back, preferably on a specially constructed table, with the buttocks projecting slightly beyond its edge, the trunk flexed just above the sacrum, the pelvis slightly elevated, the thighs well flexed upon the abdomen, the legs upon the thighs, the knees widely separated, and the feet supported upon stirrups not too far apart. This posture relaxes the abdominal muscles and removes the intestines from the pelvic cavity. The lower bowel and the bladder should be empty. Corsets should be removed and the clothing loosened around the waist. A sheet is so arranged about the patient that her limbs and body are covered and her underclothing is concealed from view, but ready access to the genitalia by touch and sight is permitted.

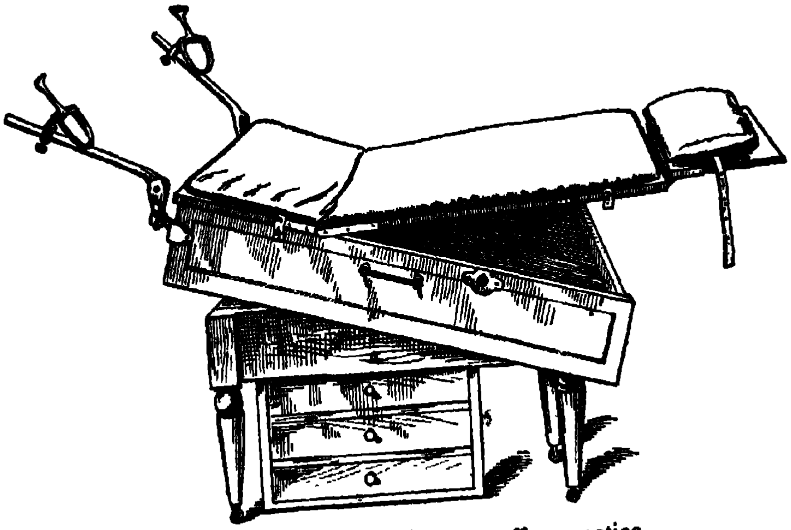
Fig. 2.—Examining table for office practice.

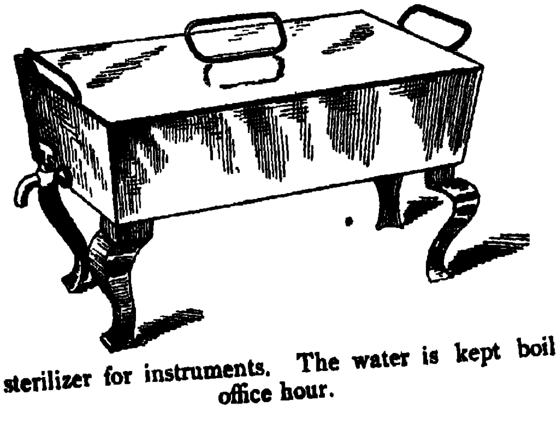
Fig. 3.—Office sterilizer for instruments. The water is kept boiling during the office hour.

If a suitable table is not at hand, the patient may be arranged across a bed with the feet supported on chairs.

The physician cleanses his left hand and anoints the first two fingers with an unguent. The best for the purpose is composed

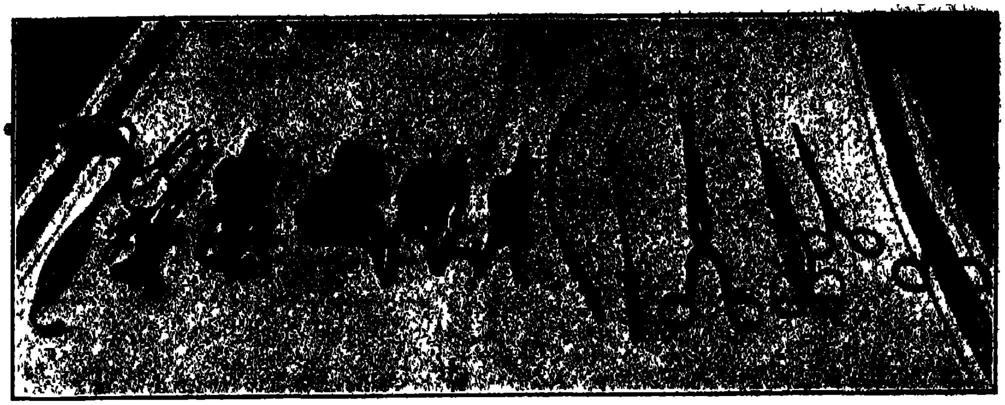

Fig. 4.—Instruments laid out for routine office work: A Sims', skeleton, Goodell, and Collin's speculum; a repositor, uterine sound, Emmet's curetment forceps, Thomas' applicator, and two dressing forceps of different lengths. The instruments have been boiled, are laid on a clean towel upon a glass-top table and covered with another towel so that they shall not alarm the patient. If the temperature of the examining room is over 70°, as it should be, the instruments need not be warmed before introduction into the vagina. If the room is cold, they should be momentarily dipped in the water boiling in the sterilizer. Immediately after use they are washed, boiled again, dried, and laid out as before.

Fig. 5.—Patient in the dorsal gynecological position, with sheet draped to protect the underclothing, but exposing the genitalia.

of glycerin and Iceland moss, scented with oil of roses.[1] If there is leukorrhea, a foul discharge, a suspicion of gonorrhea or syphilis, a short rubber glove without a gauntlet should be worn The forefinger approaches the vulvar orifice in such a manner that it first comes in contact with the posterior commissure, which is pushed backward toward the sacrum as the finger enters the vagina Unless care is exercised about this point, the vestibule and the region around the clitoris, the most sensitive portions of the external genitalia, may be first touched before the vaginal orifice is found, causing the patient unnecessary pain In inserting the finger into the vagina it should be remembered that the canal runs backward toward the sacrum, and not upward in the axis of the trunk As soon as the cervix is located, pressure is made upon the lower abdomen with the fingers of the free hand to locate the fundus uteri and to press it downward toward the finger in the vagina, until the corpus uteri is caught between the fingers of the hand above and the finger in the vagina, which has been shifted from the cervix, against which its palmar surface first rested, to the anterior vaginal vault In this way the position, size, shape, consistency, and mobility of the uterus are determined To palpate the appendages on the left side, the middle finger of the left hand is inserted alongside the forefinger, because thus a half inch in length is gained, the third and little fingers are flexed in the palm of the hand, the thumb is extended, and the hand is semi-supinated The extended fingers of the right hand are placed with their tips in a line above Poupart's ligament, and perpendicular to it, well outward toward the anterior spine of the ilium, with the palmar surfaces of the fingers directed downward and inward. This hand is semi-pronated Pressure is exerted

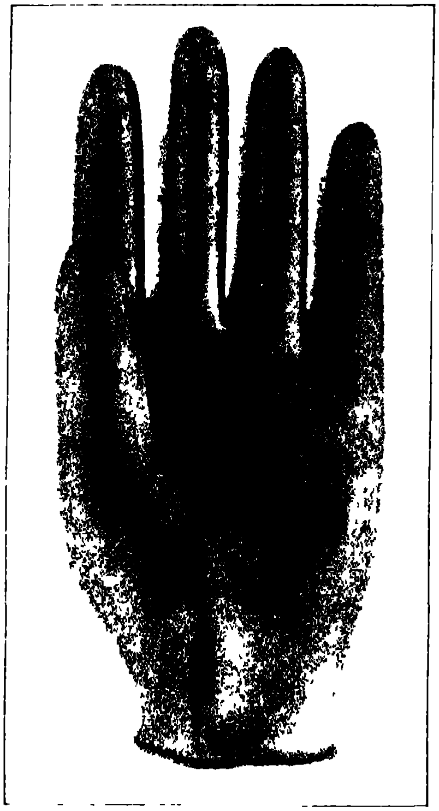

Fig. 6.—Short rubber glove gynecological examinations

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[1] A glycerin jelly, a jelly of cucumbers and hydrastis, a thick mucilage of quince seeds, or plain glycerin are all preferable to petrolatum, which stains linen and clothing.

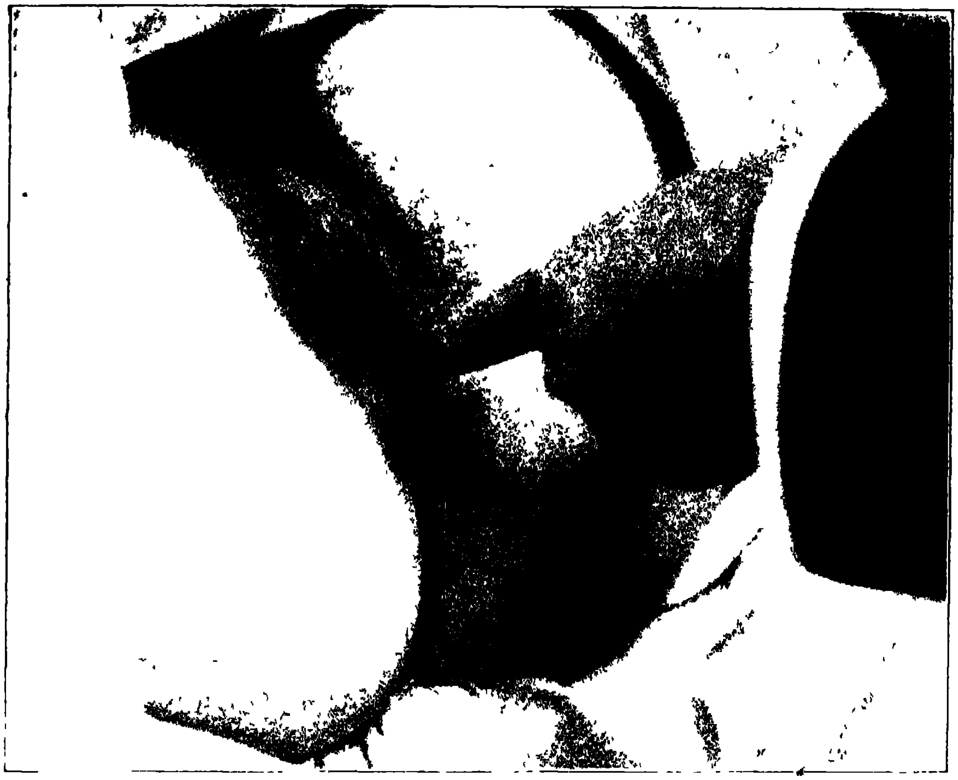

Fig 7 —Introduction of the forefinger in a vaginal examination, by retracting the perineum

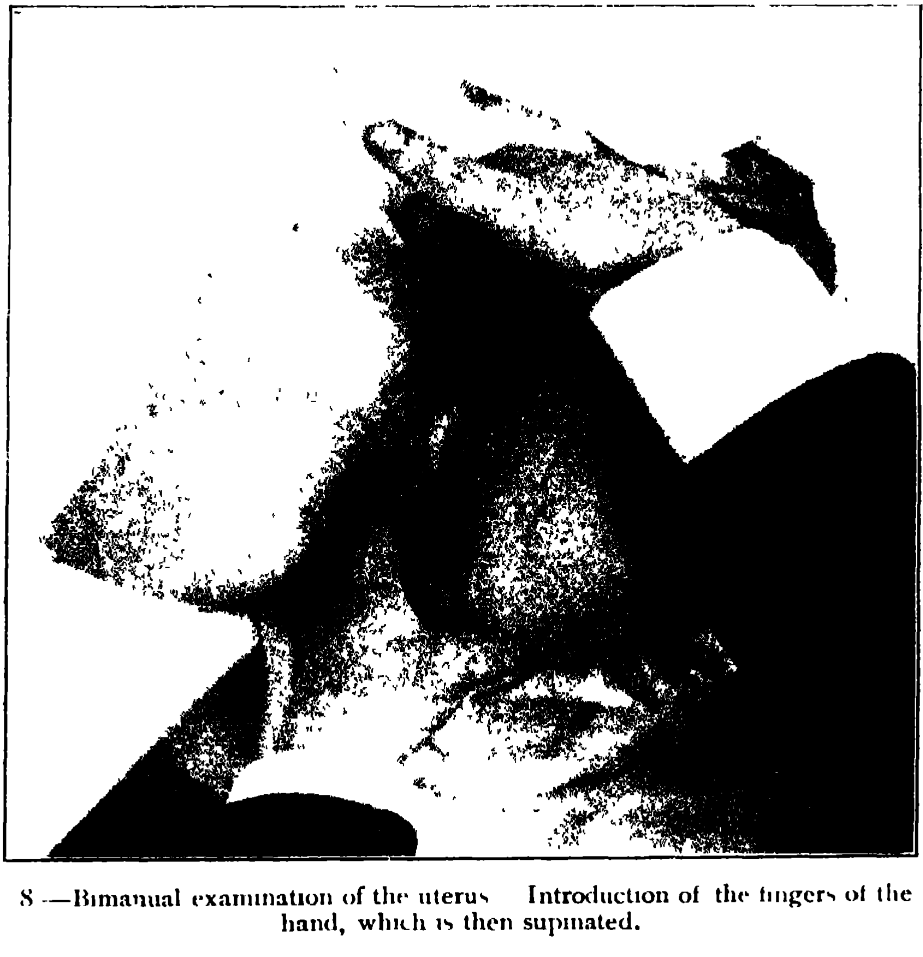

Fig 8 —Bimanual examination of the uterus Introduction of the fingers of the left hand, which is then supinated.

by the external hand downward and inward, until the ovary is caught between the external and internal fingers, and the tube can be rolled between them. To examine the appendages on the right side, the first two fingers of the right hand must be inserted in the vagina and the fingers of the left hand are used externally. It is sometimes useful to pull the uterus down by a single or double tenaculum in order to palpate it and its appendages, but in the vast majority of cases more can be accomplished by pressure from above than by traction from below, and every one

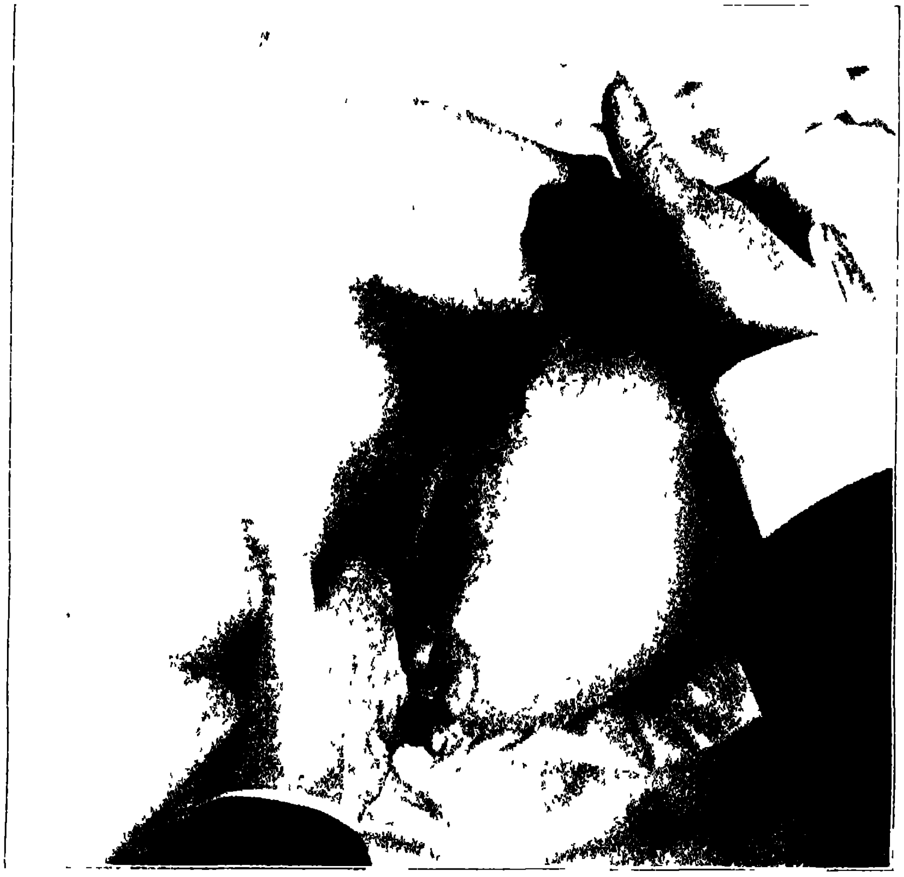

Fig. 9.—Bimanual examination of the left tube and ovary.

should aim to dispense with the tenaculum in a combined examination, for it causes unnecessary traumatism and may be responsible for infection.

As the woman lies upon her back it is usually advisable to follow the vaginal by a rectal examination. The forefinger, protected by a thin rubber finger-cot, is well anointed and is passed into the rectum its full length. Pressure is made above the pubis by the free hand, as in a combined vaginal and abdominal examination. To palpate the uterine appendages, the left forefinger is used for the left side of the pelvis, the right forefinger for the right side, counterpressure being made in the iliac regions, as already described. Very rarely it may be desirable to make a combined rectal, vaginal, and abdominal examination, which is accomplished by inserting the forefinger of the left hand in the rectum, the thumb in the vagina, and by making pressure with the free hand on the lower abdomen. The cervix and lower uterine segment can then be grasped between the thumb and the forefinger.

It is sometimes necessary to examine a patient in the erect posture—for example, to determine the degree of prolapsus uteri. For this purpose the woman's skirts are raised above her waist and are pinned behind or are removed. A sheet is pinned around her waist, draped so that it falls to the ground, and the two edges overlap in front six to twelve inches. The patient stands with her legs apart. The examiner kneels on his right knee, facing the patient, the left hand is inserted under the sheet, through the opening in the front, and the forefinger is passed

Examination in the erect posture

into the vagina, the physician's elbow being supported by his knee.

Palpation of the abdomen should constitute a part of every routine examination. Tumors or other abnormalities may thus be detected which might not be appreciable in a vaginal or a combined examination. Abnormal mobility of the kidneys is overlooked in a considerable proportion of women if abdominal palpation is omitted.

The patient is prepared for abdominal palpation by removing the corsets, loosening the skirts and the underclothing about the waist, and exposing the skin from the sternum to the pubis. The woman lies flat upon her back, with the knees slightly elevated and the feet supported. The examiner stands beside her and with outstretched hands makes pressure at first lightly, then more deeply from the flanks toward the median line, and from top to bottom of the abdomen. Deep pressure with the finger-tips may be needed in certain areas The contour of an abdominal tumor may be determined by grasping it as one grasps the fundus uteri in Credé's method of expressing the placenta By approximating the finger-tips from without inward and at the same time making deep pressure the abdominal walls are lifted away from the abdominal contents. In this way mere obesity is differentiated from an intra-abdominal tumor

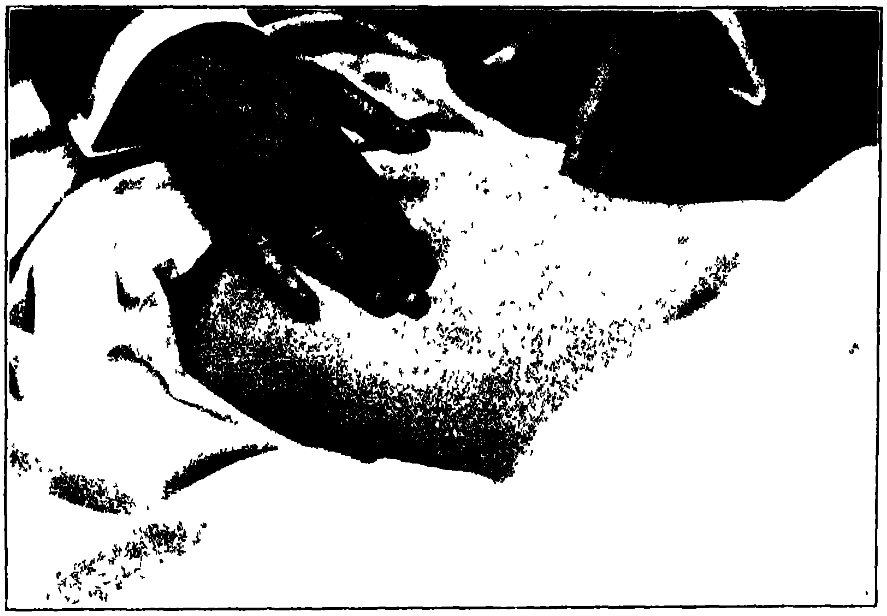

Fig. 11.—Abdominal palpation.

To palpate the kidneys the patient should be made to sit bolt upright, upon the examining table, with the abdomen freely exposed, the back and head supported, the arms hanging loosely by her side, and all the muscles as relaxed as possible. The examiner, standing beside her, places one hand on the lumbar region and slips the fingers of the other under the floating ribs in front. In this manner the kidney is caught between the two hands and its mobility can easily be tested. Another posture frequently used for palpation of the kidneys is assumed by the patient, seated, leaning forward, with the upper portion of her trunk supported by a nurse. The examination of the kidney in the erect posture with flexed trunk, in the knee-elbow and in the Sims' position is described under the head of Floating Kidney.

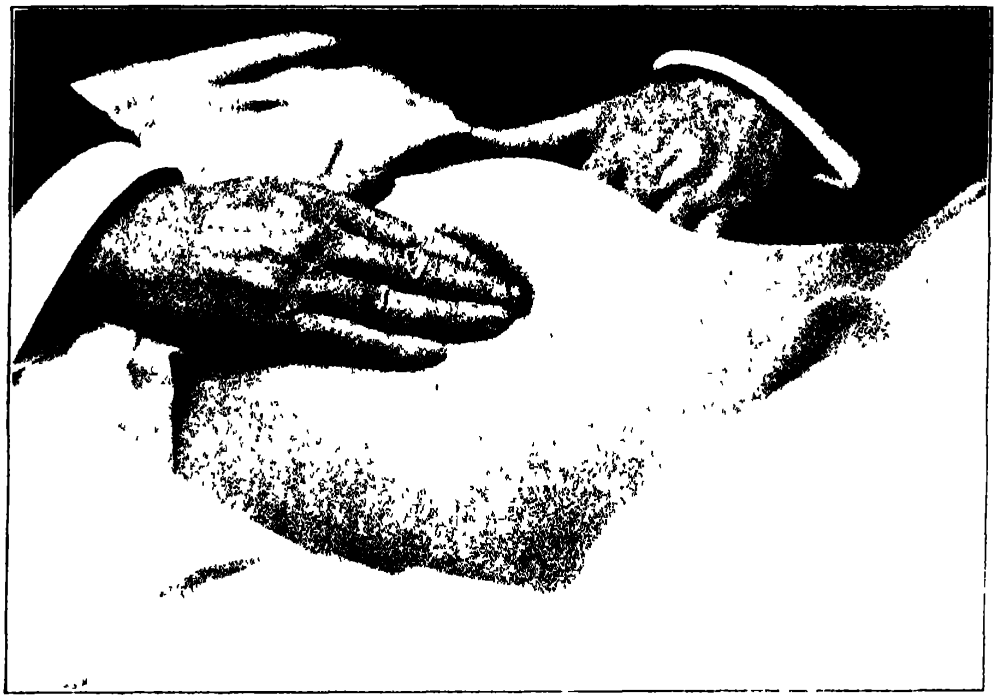

Fig 12 —Testing the thickness of the abdominal walls.

A satisfactory pelvic and abdominal palpation may be impossible without anesthesia. In an unmarried woman anesthetization should always be insisted upon unless she has been examined and perhaps treated before If the patient is a young girl, it is better to keep her in ignorance of what is to be done, and, if possible, the vaginal should be replaced by a rectal examination. If there is uncontrollable rigidity of the abdominal and pelvic muscles, hypersensitiveness of the genital region, or if for any cause the examination is difficult and the result is not perfectly clear, a physician should refuse to give his opinion of the case until an examination under anesthesia is permitted The best anesthetic for the purpose is chloroform. It secures perfect relaxation quickly, and does not, as a rule, nauseate the patient, used in the small quantities and for the short time required Ether is too slow in its action and causes too much nausea Nitrous oxid gas does not relax the muscles enough. Ethyl-bromid and chlorid are too dangerous.

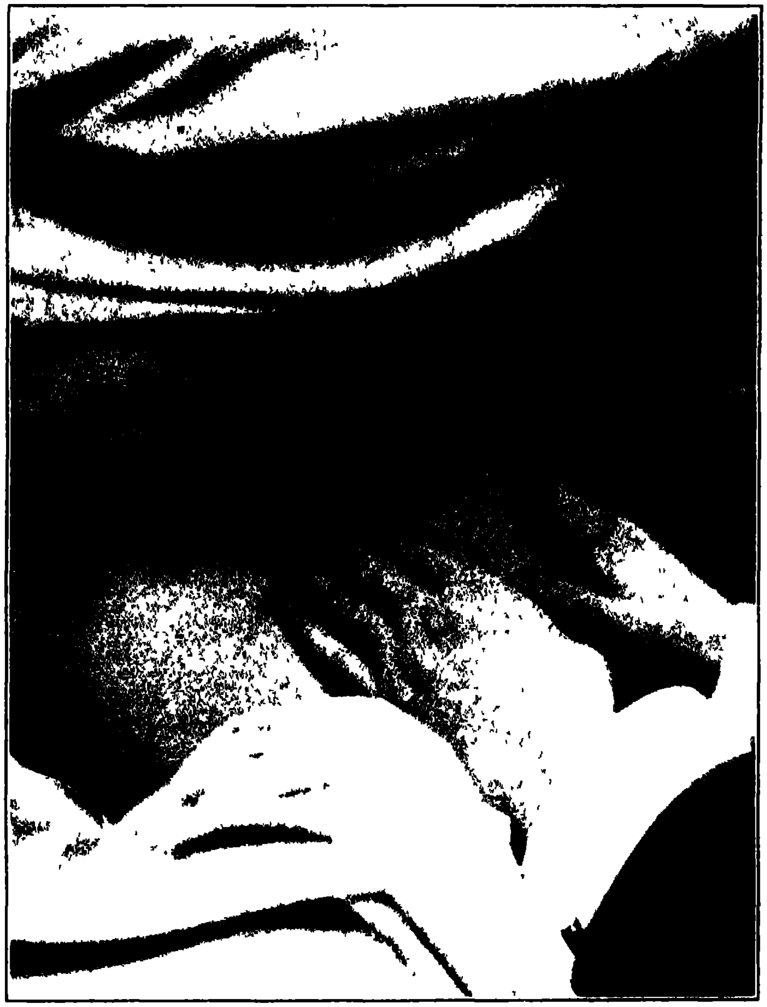

Fig 13—Palpation of the left kidney, as the patient, sitting erect, leans forward against the nurse

Inspection of the Pelvic Organs and of the Abdomen.—As the patient is arranged for a digital examination of the vagina, her vulva is exposed to view and should be inspected before the physician inserts his finger. The entrance of the vagina and the vestibule are exposed by separating the labia majora with the thumbs or forefingers The vagina itself, its vault, and the cervix uteri are exposed by the use of a bivalve or a duck-bill (Sims') speculum. The former is the more useful instrument of the two. The Collin's, Goodell's, and the skeleton are the most convenient models. Two sizes must be provided, for multiparous and nulliparous women.

To introduce a bivalve speculum, the instrument is grasped in the fingers of the right hand, near the junction of the blades, which are held close together. The tips of the blades are dipped in a jar of unguent. The forefinger of the left hand is inserted in the vagina to locate the cervix and to indicate the direction of the vaginal canal. As the finger is withdrawn the right labium majus is pushed to one side and the vaginal entrance is thus made to gape. The speculum is now inserted with the long axis of the blades corresponding with the direction of the vagina—namely, backward toward the sacrum, rather than upward in the line of the trunk, the tips are turned so that their long axis corresponds with the long axis of the vulvar orifice, and the screw is directed downward. As the instrument is passed into the vagina it is turned on its long axis so that the blades rest against the anterior and posterior vaginal walls, and the screw

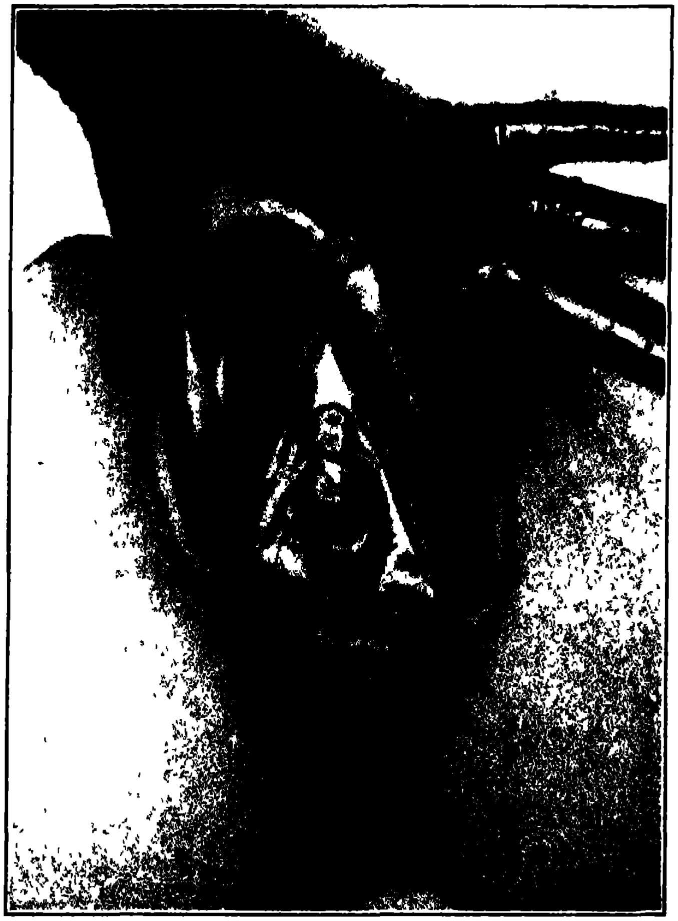

Fig. 14.—Exposure of the clitoris, vestibule, vaginal introitus, and fossa navicularis

which separates them is on the left-hand side of the woman's pelvis, where the examiner's right hand may easily manipulate it. If the proper direction of the speculum is maintained while it is being inserted, the cervix is exposed as the blades are separated; but the mistake is commonly made of not pointing the instrument far enough backward, so that when it is opened the anterior vaginal vault is exposed and the cervix is hidden beneath the posterior blade. Should this be the case, the blades

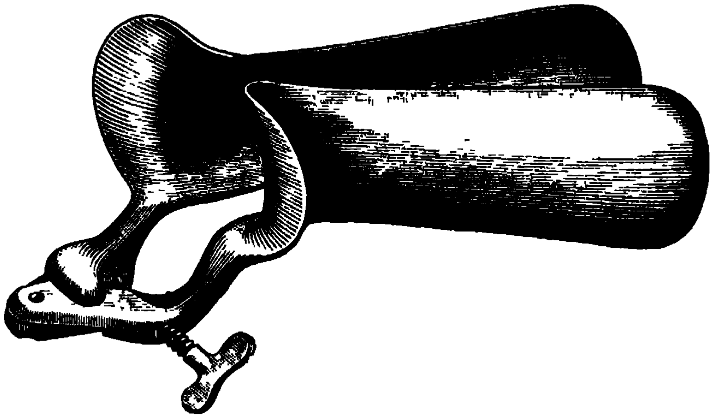

Fig. 15.—Collin's speculum.

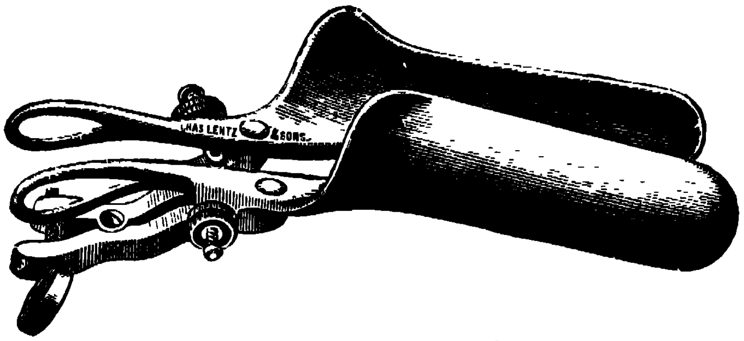

Fig. 16.—Goodell's speculum.

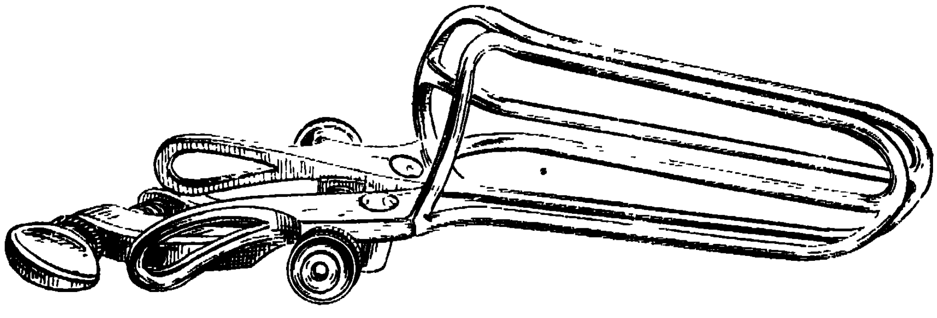

Fig. 17.—Skeleton bivalve speculum.

are allowed to collapse, the instrument is withdrawn a little and then pushed far backward toward the sacrum until the cervix comes into view as the blades are separated. If the vagina is long and its walls are relaxed, a single tenaculum may be required to catch the cervix, by passing it into the external os with the hook directed upward and catching hold of the anterior lip. A bivalve speculum properly introduced and widely enough opened is usually self-retaining, leaving the operator's hands free for whatever manipulations may be required.

If a Sims' speculum is used in the dorsal position, the anterior vaginal wall prolapses into the vulvar orifice and obscures the view of the deeper portion of the canal, so that a retractor is required to push it upward out of the way. Special instruments are devised for the purpose, but the ring handle of one blade of a two-bladed instrument, such as a Péan's forceps, answers the purpose perfectly. Edebohls has devised a self-retaining duck-bill speculum with an attachment to catch discharges and irrigating fluids, which is often very useful in the dorsal decubitus.

Fig. 18.—Introduction of the bivalve speculum.

The best results with the Sims' speculum are obtained, however, in the Sims' or semi-prone lateral position and in the knee-chest posture. In the Sims' position the patient is placed upon her side, usually the left, with the under arm behind her back, the trunk in a semi-prone position, the thighs well flexed upon

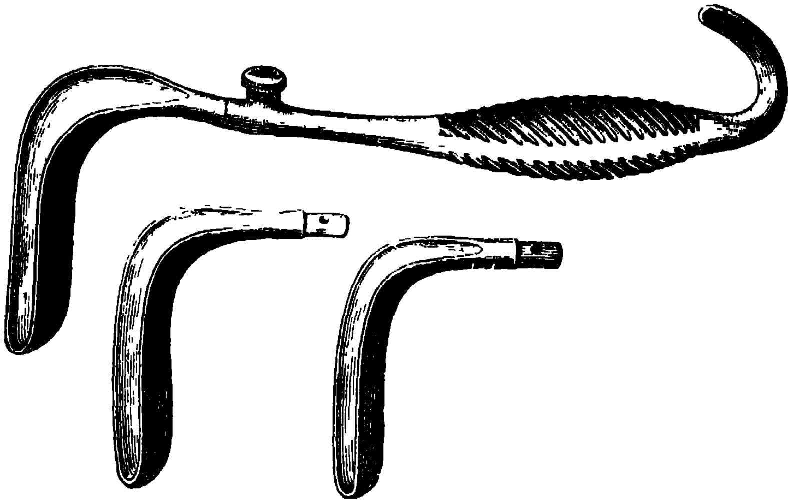

Fig 19 —Sims' specula Detachable blades of varying sizes and handle

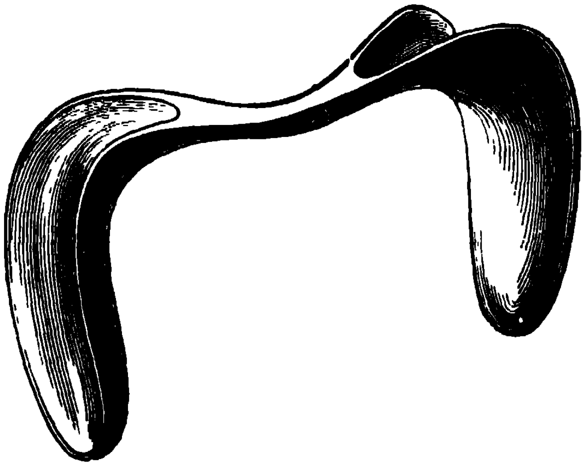

Fig. 20 —Sims' speculum. Blades of two sizes in one instrument.

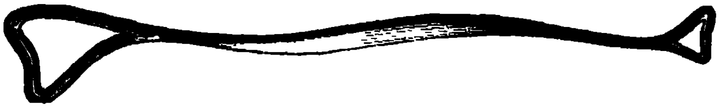

Fig 21 —Nott's vaginal depressor

the abdomen, and the legs upon the thighs, the upper leg and thigh being somewhat more strongly flexed than the lower. The advantages of the Sims' position are increased if the table on which the woman lies is tilted so that the abdomen is made still more dependent. The knee-chest posture is assumed by resting upon the knees and chest, the face turned aside so that one cheek rests upon a flat pillow and the arms so disposed that the patient can not yield to her instinctive impulse to rest upon the elbows.

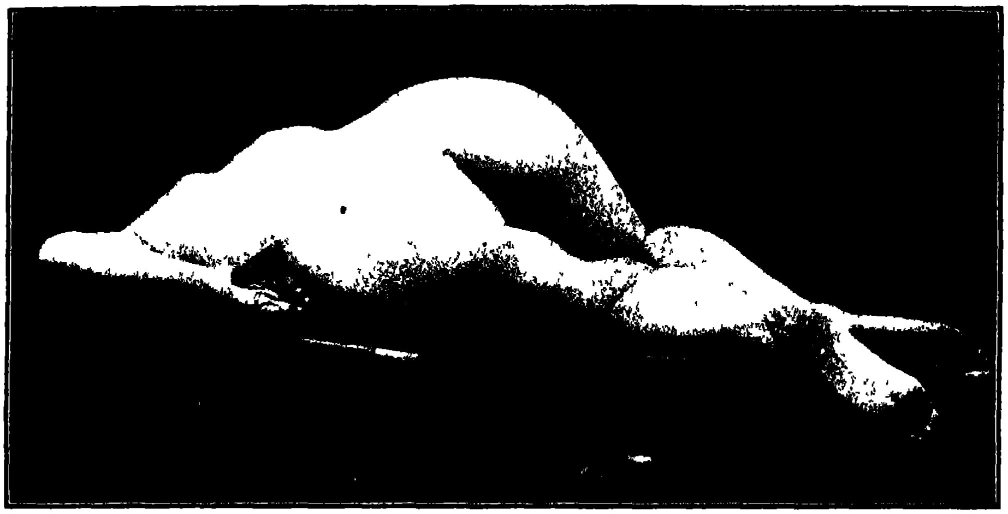

Fig 22.—Sims' position

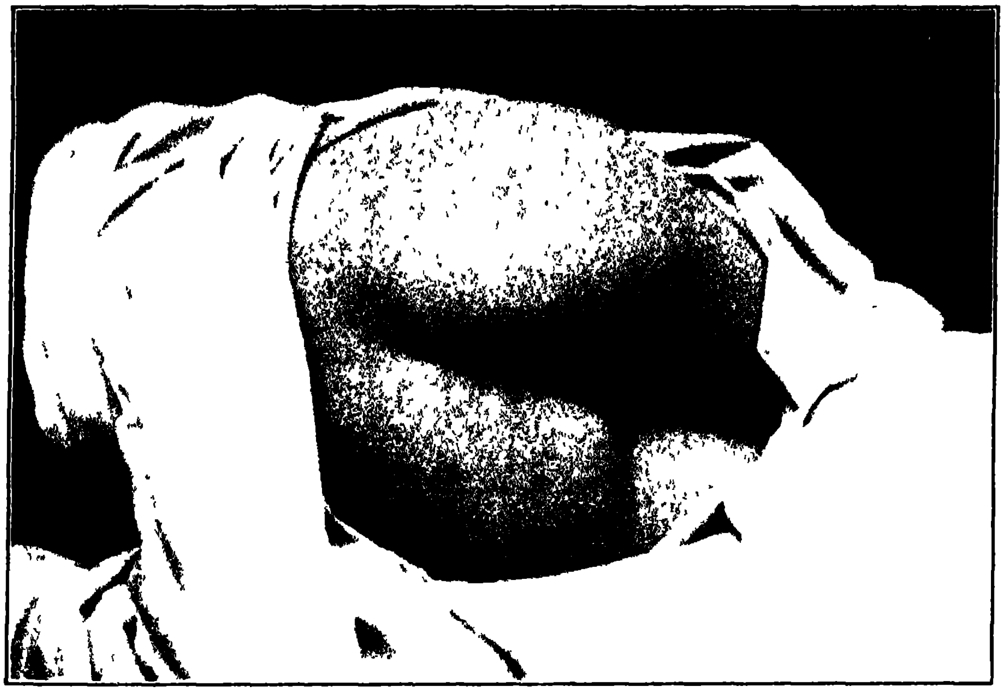

Fig 23.—Sims' position Patient draped with sheet, arranged so as not to interfere with the examination or manipulations.

The thighs should be perpendicular to the surface of the table, and the back should present a straight line or a somewhat concave curve at an angle of 90 degrees.

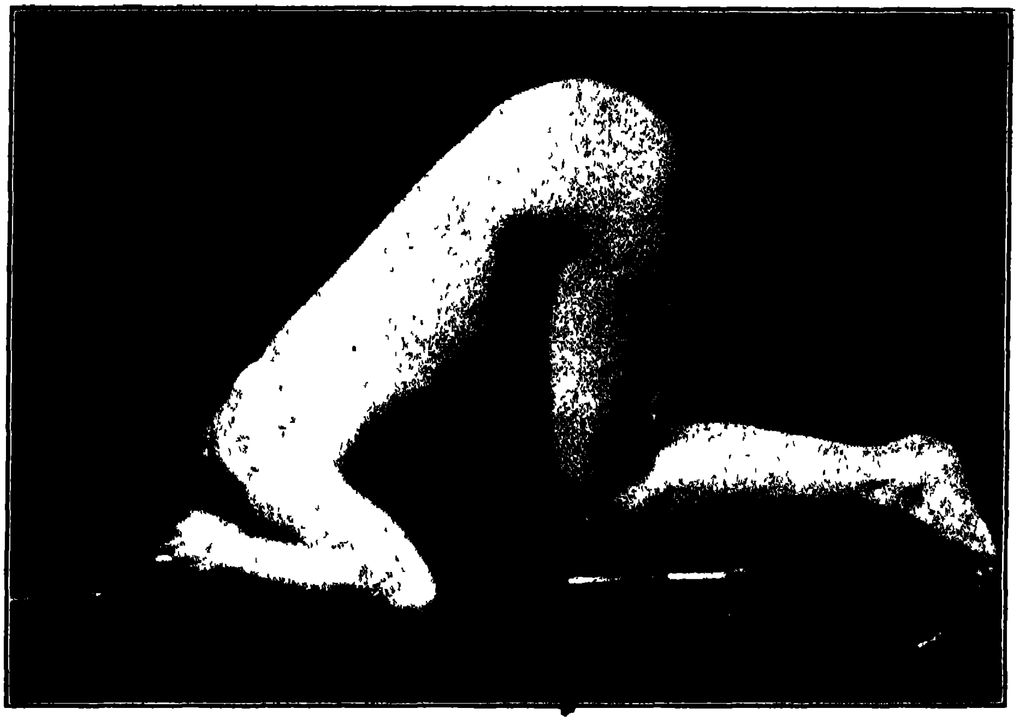

Fig. 24.—Knee-chest posture. Thighs perpendicular to the table; back at an angle of 90 degrees.

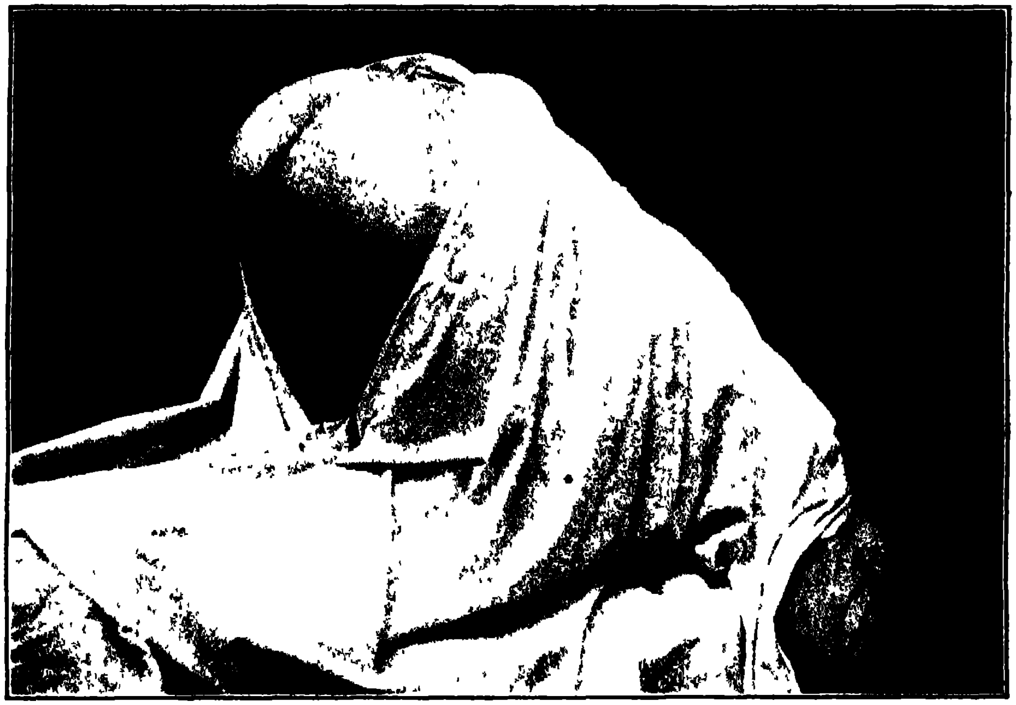

Fig 25 —Knee-chest posture. Sheet draped around patient. Posture faulty. Thighs not perpendicular.

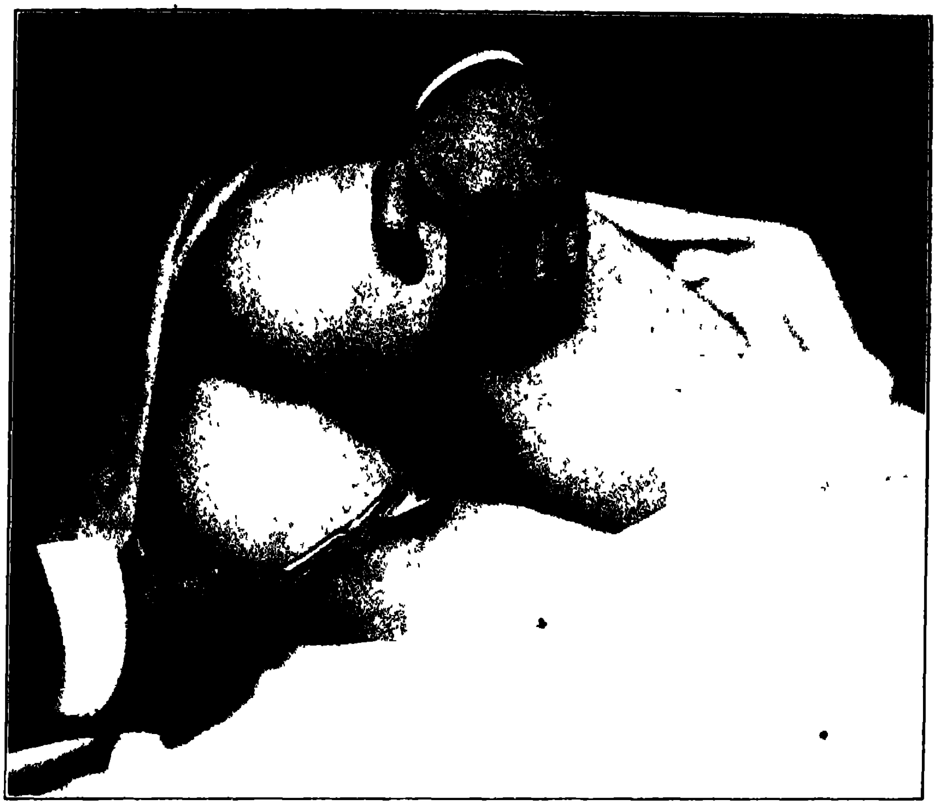

Fig 26.—Introduction of a Sims' speculum.

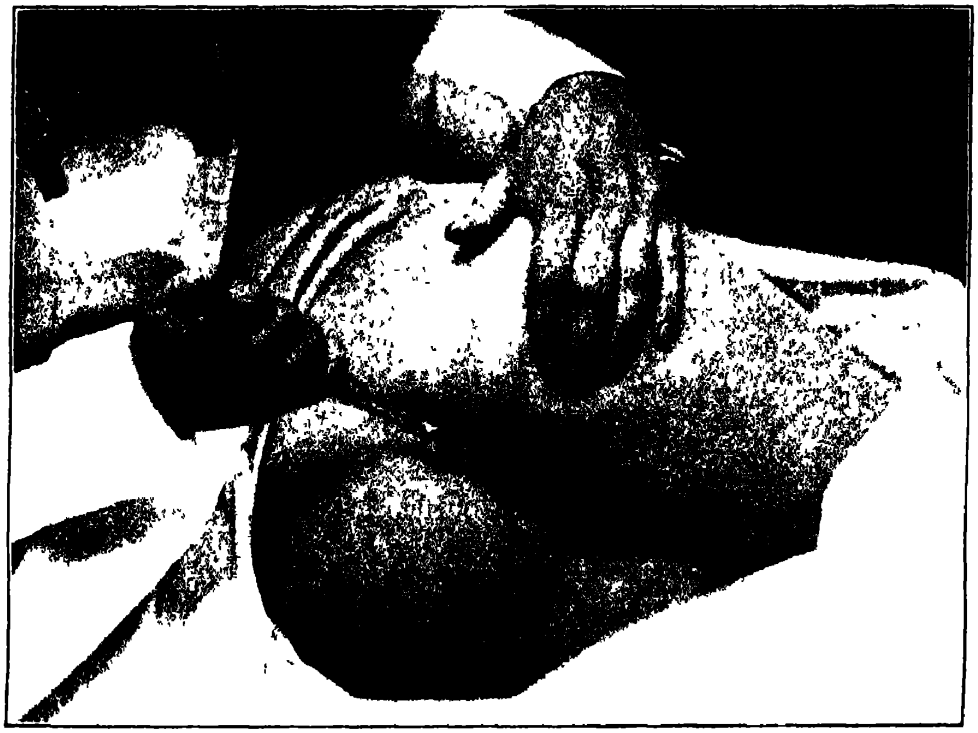

Fig 27.—Sims' speculum, introduced and held by a nurse.

To introduce the Sims' speculum in the Sims' position, the convex surface of the blade is well anointed, the handle is grasped in the full hand, the vaginal orifice at its posterior commissure is opened by raising the upper buttock, and the blade of the instrument is inserted with the long axis of its tip in coincidence with the long axis of the vulvar orifice. As it is inserted the blade is turned until the handle points directly backward toward the sacrum. The handle must also be inclined somewhat away from the perineum, else the blade will slip out An assistant holds the handle firmly in the full hand and makes considerable traction backward and outward A retractor may be needed for the anterior wall, and a tenaculum may be required to bring the cervix into view, although usually the vagina is well distended with air and every part of the canal is plainly displayed, except that covered by the blade of the instrument To insert the Sims' speculum in the knee-chest posture, the same manœuvers are practised, except that the vulvar orifice is opened for the insertion of the blade by one or two fingers

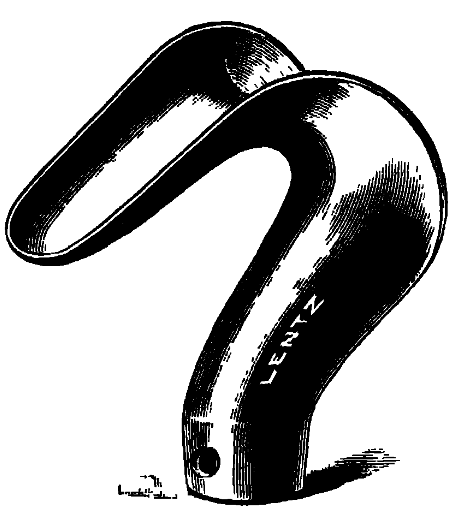

Fig 28.—Edebohls' self-retaining speculum

There are several models of self-retaining duck-bill specula, permitting one to dispense with an assistant, but they are bulky and expensive instruments, scarcely ever employed by any one who can command the services of a nurse to assist in gynecological examinations [1] Edebohls' instrument is sometimes a convenience in the dorsal decubitus, to receive discharges or fluids in a tin cup attached to its lower end

The cylindrical speculum is very rarely employed. It is only useful for the purpose of bathing the cervix in medicinal solutions, which are poured into it after its insertion until the cervix is submerged. As the speculum is withdrawn the solution bathes the successive layers of the vaginal wall which prolapse into its opening.

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[1] A word of caution in this connection is necessary to the inexperienced At least four or five of the author's personal friends in recent years have been falsely accused of attempts at assault during office examinations of female patients The physician, therefore, who expects to treat diseases of women should make any sacrifice to secure the services of an office nurse, who is not only an invaluable aid in the preparation of the patient for examination and in the various methods of examination and treatment, but is also a safeguard against a serious risk of attempts at blackmail

To introduce the cylindrical speculum the longer end is placed posteriorly. A rotary motion facilitates its introduction. It is pushed backward and upward until the cervix is engaged in its distal end. Cylindrical specula are made of metal, glass, hard rubber, and wood. The last-named material is designed for the application of the actual cautery to the cervix. Ferguson's speculum has a mirror coating on its internal surface.

The inspection of the abdomen may furnish information of the greatest value. Flaccidity of the walls, indicating enteroptosis and gastroptosis, when the individual stands erect, tympany, obesity, pregnancy, ascites, hernia, the various new growths in the pelvis and abdomen, often have a characteristic morphology which suggests at a glance the nature of the patient's disease or condition. To inspect the abdomen it must be entirely exposed. The examiner stands some distance off and looks at it first in profile; then from the patient's knees. In obesity the lower abdominal walls rest upon the patient's thighs In ascites the abdominal surface is flat, the sides bulge outward. A small ovarian cyst may distend only one side of the abdomen; a fibroid tumor may have an irregular surface, or if it is symmetrical, the outline of the tumor viewed in profile is bolder than that of other growths A huge cystic tumor of the abdomen is probably an ovarian cyst, a tumor distending the upper abdomen alone probably springs from the liver, kidney, spleen, or stomach.

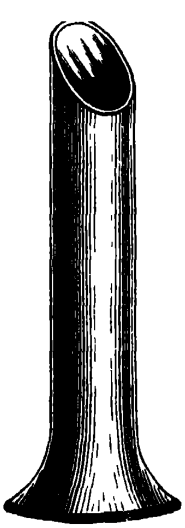
Fig 29 —Ferguson's speculum

In the degree of tympanitic distention which accompanies obstruction of the bowels, the outline of the coils of intestine may be seen. Extreme emaciation usually accompanies a large ovarian cyst or a malignant tumor with ascites. But there are numerous exceptions to these rules Ascites and hydramnios may produce as excessive and as uniform a distention as a large ovarian cyst. The latter may be situated in the upper abdomen [1] A fibromyoma of the uterus often looks surprisingly like a pregnant uterus, and tympany sometimes shows as bold an outline as a fibroid tumor. While, therefore, considerable value must be attached to the outline of the abdomen, too much dependence must not be placed upon mere appearances.

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[1] The author has seen an ovarian cyst adherent to the liver in pregnancy and held in the upper abdomen as the uterus descended during involution; also an ovarian tumor displaced under the floating ribs by tight lacing, and connected with the broad ligament by a very long pedicle.

Percussion and Auscultation.—A dull or tympanitic note on the percussion of the abdominal contents has the greatest significance; the latter indicates a solid or cystic tumor; the former, distended intestines. It should be remembered, however, that inflated intestines may prolapse in front of an intra-abdominal tumor, or that there may be a retroperitoneal growth. Deep percussion is necessary in such a case to detect the solid mass beneath the bowels. In ascites there is tympany on the anterior surface of the abdomen, dullness in the flanks, as the patient lies upon her back The fluid gravitates to the lowest portion of the abdominal cavity, so that the dullness changes with alterations in the patient's posture In an ovarian cyst there is dullness on the abdominal surface and a corona of tympany around the tumor on the flanks and in the epigastrium

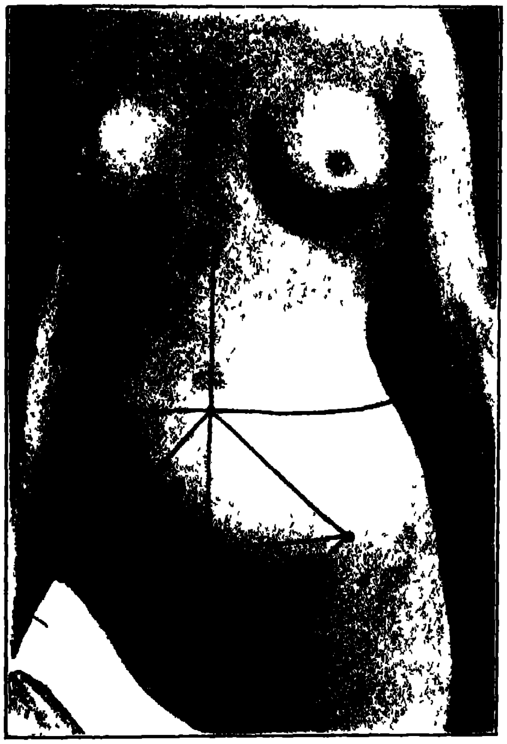

Fig. 30.—Measurements of the abdomen to indicate the growth of an abdominal tumor.

Auscultation is employed in the differential diagnosis between pregnancy and other abdominal tumors to detect the fetal heart-sounds and the funic souffle. The so-called "placental bruit" is of no diagnostic value It may be heard in fibroid tumors as well as in the pregnant uterus. Auscultation may also be of use in the diagnosis of peritonitis to detect the presence or absence of peristalsis.

Mensuration of the Abdomen.—To record the dimensions of an abdominal tumor or to determine its rate of growth abdominal measurements are taken with a tape-measure, preferably in the metric scale. The greatest girth of the abdomen is measured, then the distances between the ensiform cartilage and the umbilicus; between the umbilicus and the symphysis pubis; the anterior superior spines of the ilia; the spines of the ilia and the symphysis; the spines of the ilia and the umbilicus.

Exploration of the Uterine Cavity.—In cases of metrorrhagia it is usually necessary to explore the interior of the uterus. Often a dilatation of the cervical canal must precede the intra-uterine exploration. The dilatation of the canal is effected by branched dilators, graduated bougies, tents, and gauze or cotton packing. Branched dilators are the most efficient and convenient instruments for the purpose, but their use ordinarily necessitates anesthetization. If the os is fairly patulous, the uterine cavity may be explored by a small Sims' curet and by the Emmet curetment forceps, the fragments removed being preserved in a 10 per cent formalin solution or absolute alcohol for microscopical examination In some respects a digital exploration of the uterine cavity is the most satisfactory, but such a wide dilatation of the cervical canal is required, and so much force is needed to insert a forefinger to the fundus uteri, that anesthesia is necessary.

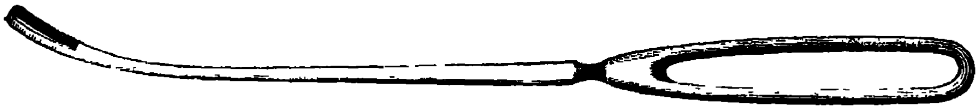

Fig 31 —Sims' sharp curet

As first pointed out by Vulliet, the uterine cavity may be packed with small pledgets of cotton soaked in an ethereal solution of iodoform, to each of which a string is attached By continuing the packing for a sufficient length of time from day to day, the uterine cavity is not only open to touch, but actually to inspection as far as the fundus. The use of sponge, tupelo, and laminaria tents, while a very convenient mode of dilating the cervical canal, is not usually advisable, for the danger of infection is great Efforts to avoid this disadvantage have been made by surrounding the tents with rubber tissue, by giving them a coating of soap and salicylic acid, and by soaking laminaria tents in strong solutions of carbolic acid in alcohol, but even with these precautions the retention in the cervix and uterine cavity of soft

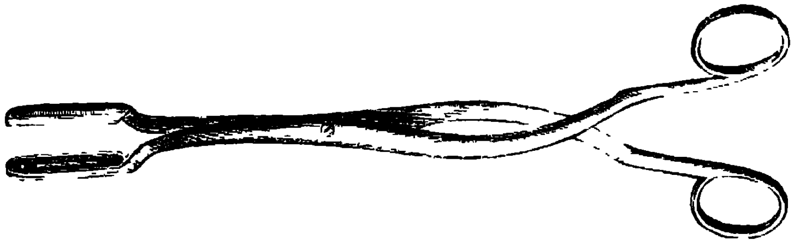

Fig 32 —Emmet's curet forceps

and spongy material, soaked with putrescible discharges, is not safe. The other methods at command for dilating the cervical canal are preferable. It is very rarely useful to explore the uterine cavity with a sound. This implement at one time was considered indispensable in routine gynecological examinations and was employed in almost every case. It was, however, productive of infection in numbers of instances. As little is gained by the insertion of such an instrument into the uterine cavity, and as from its employment the patient is subjected to serious risk of uterine and tubal infection, its use should be limited as strictly as possible. A busy gynecologist should scarcely employ a uterine sound once in six months. When it is required, it should be sterilized by boiling, and at the same time a bivalve speculum, a cotton forceps, and a single tenaculum must be prepared in the same way. The bivalve speculum is inserted and opened widely. The cervix is pulled down, is steadied by the tenaculum, and is carefully wiped off with a pledget of cotton on a cotton forceps soaked in a 1:1000 sublimate solution. The uterine sound is then inserted directly into the external os through the speculum without touching anything except its blades.

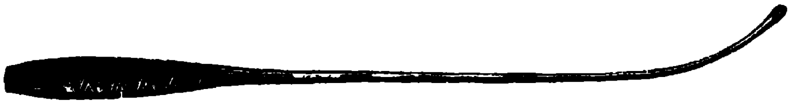
Fig. 33 —Thomas' uterine probe

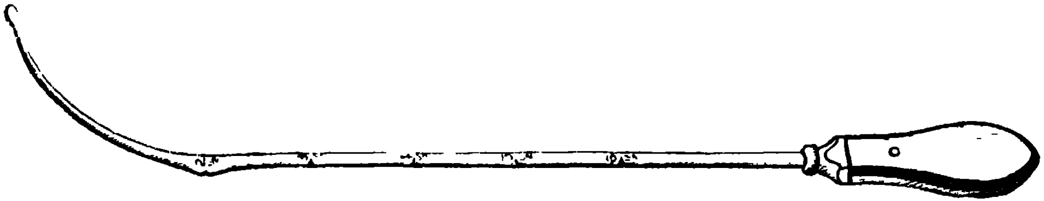
Fig 34 —Simpson's uterine sound.

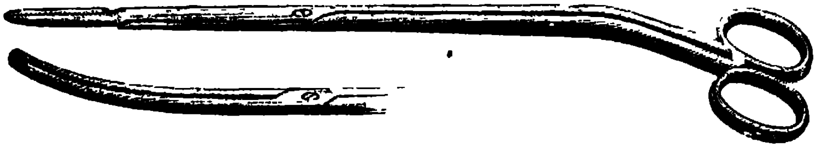
Fig 35 —Elliot's cotton forceps

In addition to the danger of infection, the sound exposes the woman to some danger of perforation of the uterine wall. It should therefore be employed gently, and no forcible pressure should be used in projecting its tip against the fundus uteri. In cases of uterine flexion sufficient curvature must be imparted to the flexible instrument to pass the angle of flexion easily, and care must be exercised to employ no force against the portion of the uterine wall opposite the angle of flexion. In anteflexion it is often more convenient to insert the sound with the tip turned downward until the angle of flexion is reached, then by a rotary sweep of the handle the point is turned upward and so enters the uterine cavity to its full depth. A reverse movement may be employed in cases of retroflexion.

An effort has been made to devise a uterine endoscope with practically the same construction as a urethroscope, but the instrument is not yet practical

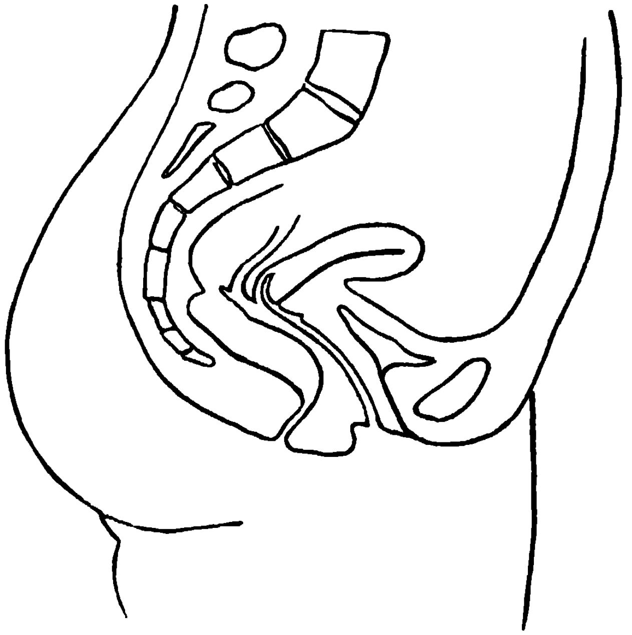

Fig 36 —Outline stamp of the pelvic cavity

Notes of every case examined should be taken and should be preserved on indexed cards or in indexed case-books Even the busiest practitioner can find the time if he cultivates the habit from the beginning The essential features only of each case need be recorded Diffuse note-taking is often a waste of time and may lead finally to the neglect of case-histories altogether. Dickinson's rubber stamps of the pelvic and abdominal outlines are often serviceable for the brief graphic description of a condition Printed forms to be filled out are not to be recommended, because they are too inflexible, and to meet the requirements of every possible case are usually too long.

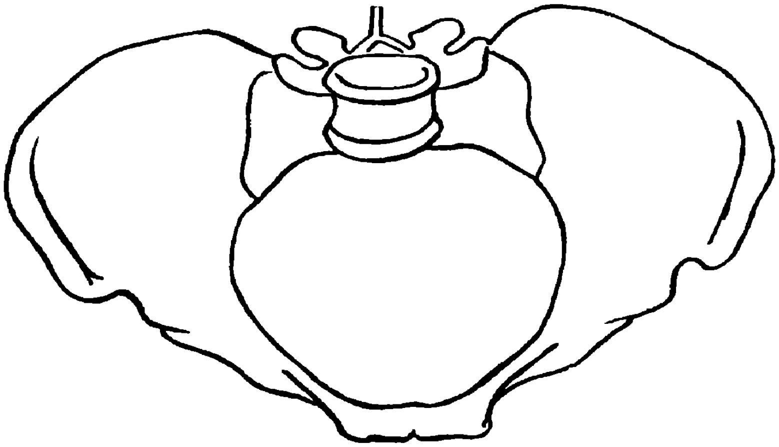

Fig. 37.—Outline stamp of the pelvic cavity.

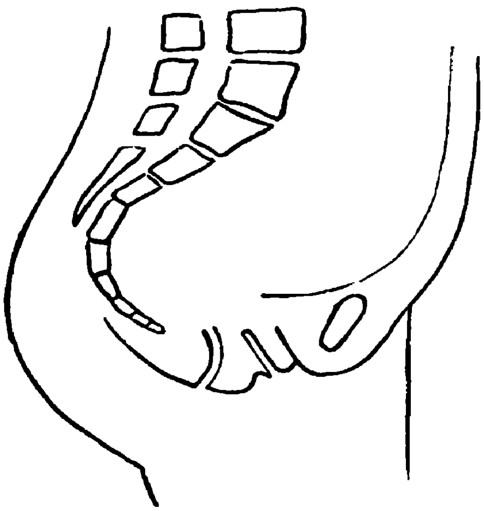

Fig. 38.—Outline stamp of the pelvic cavity.

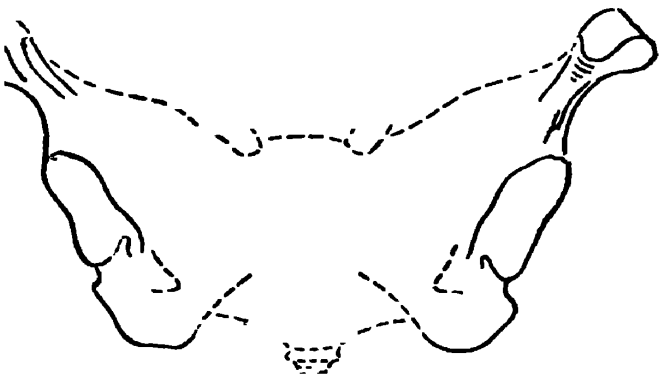

Fig. 39.—Outline stamp of the pelvic cavity.

LOCAL TREATMENT.

The local palliative treatment of diseases of the pelvic organs is of subordinate importance. The routine vaginal and intra-uterine applications, once the greater part of a gynecologist's daily work, are now only exceptionally employed

Vaginal douches are best administered from a fountain or a Davidson syringe, preferably the former. If the patient gives herself the douche, she should always be warned about the possible dangers of uterine colic, shock and infection. Deaths are reported occasionally from the administration of a vaginal douche. The syringe bag should not be more than three feet at the most above the level of the vaginal orifice, and it is better to have it lower. The vaginal nozzle with openings on the side and not at the end should always be employed The nozzle must be clean It should be rinsed out in running water after use and put away where it can not become dusty or soiled Just before use it should be thrown for a moment or two into boiling water, or should be kept immersed in a sublimate solution, 1 : 1000. The temperature of the water should be about 100° F , unless there is a special indication for hot douches, when it should be from 115° to 120° F.

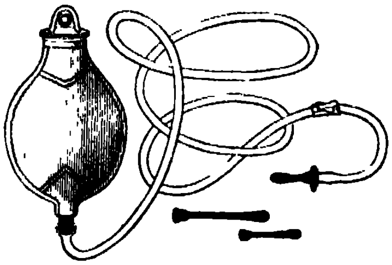
Fig 40 — Fountain syringe

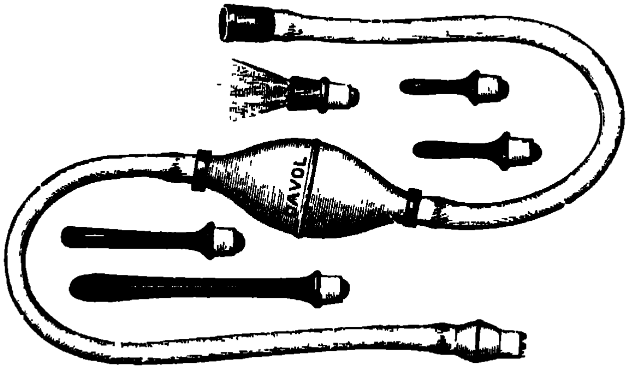

Fig 41.—Household bulb syringe (Davidson's)

The vaginal douche is most effective if taken in the dorsal position, and is best administered by a nurse, the patient's buttocks resting upon an oblong bedpan of considerable depth, so that the hips are slightly elevated and there is ample capacity in the pan for large quantities of water The ordinary shovelshaped bedpan is not suitable. If the patient administers the douche herself, the easiest way for her to take it in the recumbent posture is in a bathtub, although with a little practice she can manage it on the bedpan as described. There are special devices for retaining a quantity of the fluid in the vagina and allowing it to escape through a separate exit to which a rubber tube is attached that can be led into a receptacle in or alongside of the bed. Occasionally such a device is convenient, but ordinarily the retention of fluid in the vagina can be secured, if desired, by holding the hand over the vulvar orifice until there is some distention of the vaginal canal. This practice, however, entails upon the patient the risk of injecting fluid into the uterine cavity, causing uterine colic and possibly serious shock. If the Davidson syringe is used, the patient should be cautioned not to press the bulb too forcibly or suddenly. The medicinal ingredients of a douche should as a rule be the milder antiseptics, such as permanganate of potassium, boracic acid, or a mixture of alum and sulphate of zinc. It is not wise to prescribe sublimate solutions indiscriminately. Mistakes may be made in the strength of the solution, and the patient might be careless about washing out the residual solution at the close of the douche by simple water. Carbolic acid is also somewhat dangerous because it may not mix well with the water and may cause severe burns. A vaginal douche should not be prescribed unless there is some well-defined indication for it, and its routine use should not be permitted indefinitely. Many patients acquire the habit of constantly resorting to a vaginal douche without sufficient cause. It is not required for mere cleanliness. Nature has provided germicidal properties in the vaginal canal which are more efficient safeguards to the woman than injections of medicated fluid.

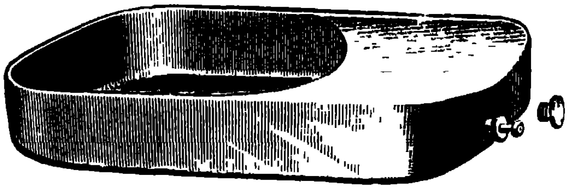

Fig 42 —Douche pan

Intra-uterine injections should always be administered by the physician himself, with as much care as is required for a major operation. The instruments used should be boiled and he should wear sterile rubber gloves. Before inserting the instruments, the vagina should be scrubbed with tincture of green soap, water, and pledgets of cotton, and should be douched with a sublimate solution, 1 : 4000, washed out with sterile water. A bivalve speculum, previously boiled, should then be inserted and widely opened so that the cervix is well exposed to view. The vaginal portion of the cervix should be wiped off with pledgets of cotton soaked in a sublimate solution by means of a dressing forceps. The two-way catheter is then inserted into the uterine cavity until its tip is felt to impinge against the fundus uteri. Before inserting the catheter, fluid should be allowed to flow through it so that no air shall be injected into the uterus when the irrigation is begun. The best two-way catheter for intra-uterine injections is the Fritsch-Bozeman. Unfortunately, the introduction of this catheter requires a patency of the cervical canal which is not always found in a nulliparous woman. If it is necessary to administer an intra-uterine irrigation in a woman with a contracted os and cervical canal, Talley's intra-uterine or Skene's reflux catheter is better than the Fritsch-Bozeman, but none of the catheters designed for introduction through an undilated canal permit of as free a reflux as they ought,

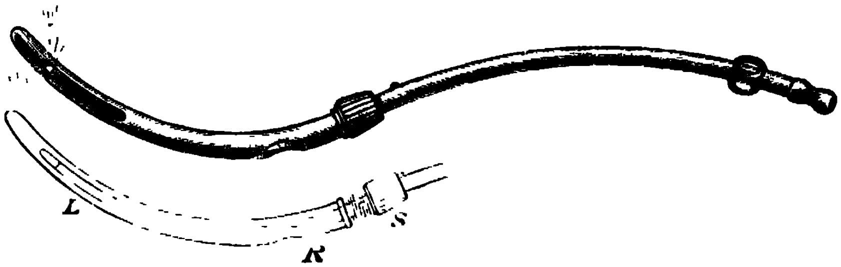

Fig. 43.—Fritsch's intra-uterine douche. *L*, Inlet; *R*, outlet; S, screw junction.

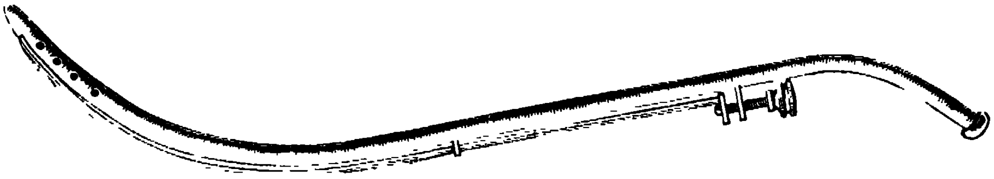

Fig. 44.—Talley's intra-uterine catheter.

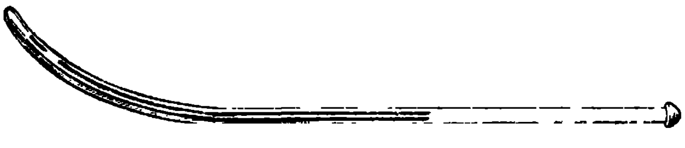

Fig. 45.—Skene's reflux catheter.

and there is always danger of uterine colic and regurgitation of fluid through the tubes. It is better to precede such treatment by a forcible dilatation under anesthesia. If at the same time a thorough curettage is performed, there is little occasion afterward for the repeated irrigation of the uterine cavity. The temperature of the water for an intra-uterine douche should be about 100° F. If sublimate solution is used, it should invariably be followed by at least a pint of sterile water. The force of the flow should not be too great. The elevation of the can or syringe bag should never be more than two feet above the level of the external os, and if there is doubt as to the free escape of the fluid, the elevation should not be more than a foot.

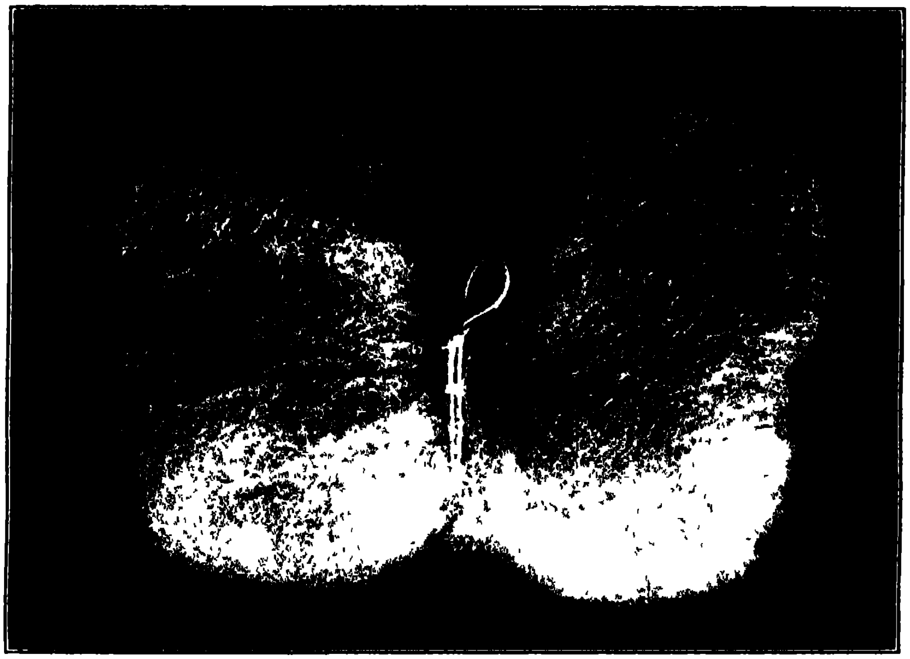

Fig 46—Vaginal tampon of lamb's wool, with twine tied around its middle. When the loop is pulled tight the end is long enough to project from the vagina

Vaginal tampons are used for conveying medication and keeping it applied to the vaginal portion of the cervix the vaginal vaults, and the vaginal walls, and also to exert pressure upon the vaginal vault and the superimposed tissues. The best material for vaginal tampons is lamb's wool in bulk and not in sheet form. Pledgets of the wool varying in size are tied in the middle with a loop of twine in such a manner that the knot is hidden in the wool, leaving the loop somewhat more than the length of the vagina, so that the tampon can easily be removed by the patient herself, who hooks her finger into the loop and makes traction outward and forward. The tampon material should be sterile. It is supplied in packages which are said by the makers to contain sterile wool, but it is safer to have the material sterilized before use in an autoclave steam sterilizer, and to keep the tampons in a clean glass jar with a well-fitting top that protects them from dust or other contamination The material used to medicate the tampons is usually dry boracic acid powder, boroglycerid, glycerin and ichthyol, six parts to four, and tannic acid powder The tampons are inserted through a bivalve speculum if they are designed to carry medication into the deeper portions of the vaginal canal. If it is desired to exert pressure on the vaginal vaults, the tampons should be inserted with the patient in the knee-chest posture. A Sims' speculum is used to retract the perineum and posterior vaginal wall, and the tampons are packed in with an Emmet curetment forceps held with the convexity upward Each tampon is dipped in a jar of dry boracic acid powder before it is inserted. If the patient herself must insert the vaginal tampon, it is most convenient to provide her with gelatin capsules that are made to contain a lamb's-wool tampon of average size. In the cup-shaped top of this capsule the medication required can be placed. The capsule is then closed, is anointed with an unguent, and inserted as deeply as possible into the canal

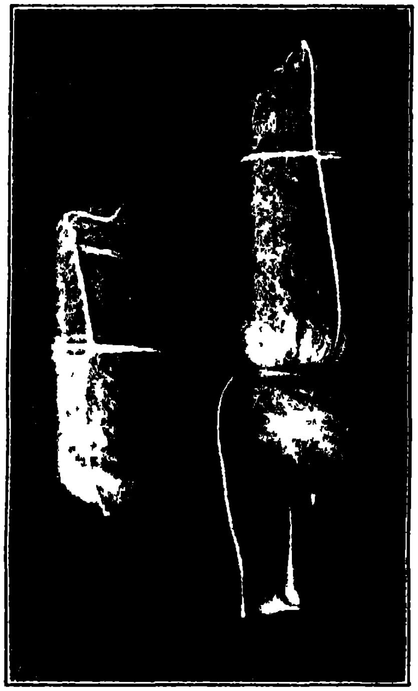
Fig 47 —Vaginal tampon in gelatin capsule

Applications to the mucous membrane of the vaginal vaults and walls and to the vaginal portion of the cervix are made by the introduction of tampons, as already described, or else, after the exposure of the vaginal mucous membrane by a speculum, are directly made by a pledget of absorbent cotton held in dressing forceps and saturated with whatever medicament it is desired to apply. Iodin, carbolic acid and glycerin, equal parts, solutions of nitrate of silver of varying strength, weak solutions of chlorid of zinc and of sulphate of copper are the materials ordinarily employed A bivalve speculum gives the best exposure of the vaginal portion of the cervix and of the vaginal vaults. The cylindrical speculum also exposes the cervix, but is not so convenient. The best speculum for the exposure at the same time of the vaginal portion of the cervix, the vaults, and the vaginal walls is the skeleton bivalve speculum made in the shape of a Goodell speculum, of narrow tubing and without solid blades.

Intra-uterine Applications and Tamponade.—A number of appliances are available for the application of medicaments to the uterine mucous membrane. The most convenient and the one generally employed is an intra-uterine applicator. The best model is the Thomas. Between the blades of the forceps a small pledget of absorbent cotton is caught and twisted around the ends The cervix is exposed with a bivalve speculum, is wiped off with a pledget of cotton and sublimate solution, is caught with a single tenaculum, and the cotton on the end of the applicating forceps, saturated with the material which it is desired to introduce, is inserted to the fundus uteri. The forceps is then moved from side to side so that the whole uterine mucosa is reached, and the applicator is allowed to remain *in utero* for about a minute, so that the material with which the cotton is saturated has time to trickle down the sides of the uterine cavity and appear at the external os.

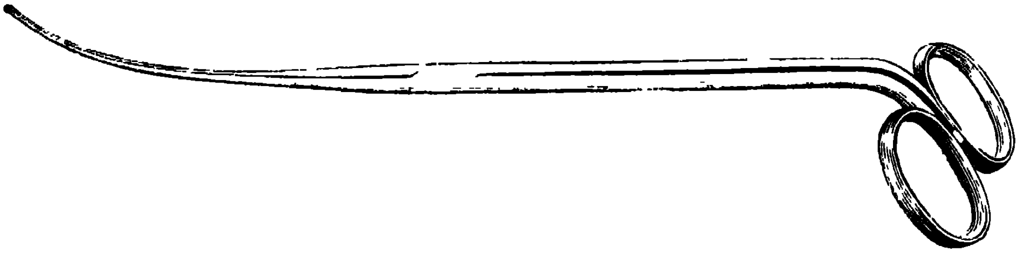

Fig 48 —Thomas' uterine dressing forceps

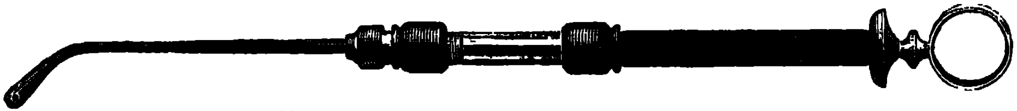

Fig 49 —Braun's intra-uterine syringe

Braun's intra-uterine syringe is also a convenient implement for conveying liquids to the uterine mucosa, but it has the disadvantage of often exciting severe uterine colic. The end of the syringe should always be wrapped in absorbent cotton so that the fluid can not be injected into the uterine cavity too suddenly or in too large quantities ; but even with this precaution uterine colic often occurs. The Braun syringe should never be used unless the cervical canal is more than ordinarily patulous. A convenient method of applying medicaments to the uterine mucosa is the uterine soluble bougie, which is most conveniently inserted by a special bougie carrier made for the purpose. It is also possible to insert the bougie by a dressing forceps which catches the end of it and passes it directly into the uterine cavity. The bougies can be medicated, as the physician desires, with astringents, antiseptics, and analgesics. A useful prescription is one of protargol, hydrastinin, and small quantities of morphin. After the insertion of the bougie a vaginal tampon or two must be packed firmly against the cervix to prevent its escape, and the patient should maintain the dorsal position with elevated hips for five or six minutes. A corrugated bougie is sometimes useful for carrying unguents into the uterus or the cervical canal.

A tamponade of the uterine cavity may be made in two ways. The best is to insert a narrow strip of gauze from half an inch to an inch in width and of sufficient length to fill the cavity completely. The cervix is exposed with a bivalve speculum, is caught with a single tenaculum, and the end of the gauze strip is seized with the Thomas applicating forceps, and is carried to the fundus uteri Successive portions of the strip are then seized and inserted until the cavity is completely filled Special applicators for gauze strip tampons are made on the same principle as the bougie carrier, except that the tip of the piston is serrated in order to catch the gauze strip more securely. The gauze is fed into the distal end of the canula and is carried into the uterine cavity by a pumping movement of the piston within it. A simpler appliance is a cylindrical speculum with a handle, for insertion in the cervical canal. Through this the gauze is packed by any straight, slender instrument Vulliet's method of tamponing the uterine cavity is to insert a number of small cotton balls, each with a piece of thin twine attached to it, soaked in an ethereal solution of iodoform, and dried It is possible, by renewing the application of these cotton balls from day to day, to secure a wide dilatation of the uterine cavity and of

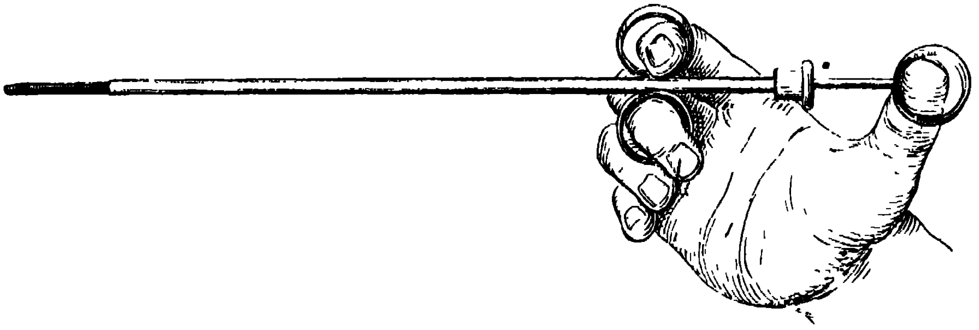

Fig 50 —Bougie carrier

the cervical canal in the course of time, but there is risk, in successive intra-uterine applications of this kind, of dangerously infecting the uterine mucosa. The gauze tampon of the uterine cavity may be saturated with liquid or dusted with powder, but it is not safe to make repeated intra-uterine applications which remain *in utero* for any length of time. Indeed, in all intra-uterine treatment the greatest care must be exercised to secure the most perfect asepsis, and it is unwise to carry out intra-uterine medication of any sort repeatedly as a routine treatment.

Local bloodletting by puncturing the cervix is often indicated in congestions of the uterus and of the cervix, to relieve acute symptoms or to prepare the cervix uteri for operative treatment. The best means of depleting the womb in this way is to puncture the cervix with Buttle's spear. It is often advisable to puncture retention cysts of the cervical glands by this implement Occasionally Kelly's knife-bladed tenaculum is more convenient for the purpose, as it may reach retention cysts within the cervical canal that can not so readily be punctured with the spear The use of leeches is a common practice upon the continent of Europe, but is scarcely ever resorted to in America It is a disagreeable mode of treatment, and there is some risk of a leech entering the uterine cavity. The same results can be more conveniently secured by puncture with an instrument

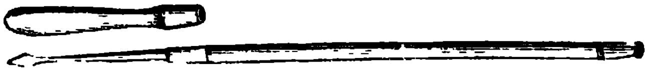

Fig. 51 —Buttle's scarificator

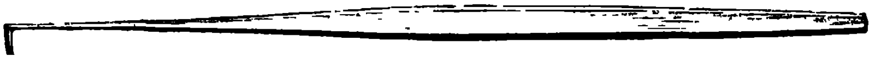

Fig. 52.—Kelly's knife-blade tenaculum.

Electricity is an invaluable local application in a limited number of conditions. The disappointment following electrical treatment of uterine tumors and other pathological conditions of the genitalia has led to a neglect of electrotherapeutics in gynecology. While the field for this agent is a limited one, there are certain conditions which can be dealt with more successfully by electrical than by any other treatment The application of the positive pole of a galvanic current in the uterine cavity is a valuable hemostatic agent. The negative pole of a galvanic current is one of the best treatments for amenorrhea Galvanism and faradism of the uterine muscle is the best treatment for an ill-developed uterus.

It is often necessary to apply electricity to a sphincter ani which has been injured and inactive for years, though successfully repaired, and a bipolar electrode in the urethra will often restore continence if the sphincter of the bladder and the compressor urethræ muscle are partially paralyzed from pressure in labor. An electrical cabinet connected with the street current and designed to furnish the different forms of electricity in varying strengths is an indispensable appliance in the specialist's office. A bipolar flexible electrode is necessary for intra-uterine and intra-urethral applications. A unipolar intra-uterine electrode is required for the positive and negative poles of a galvanic current. Bipolar and unipolar electrodes are useful for anal applications. A cone-shaped electrode is required for mild cauterization of the

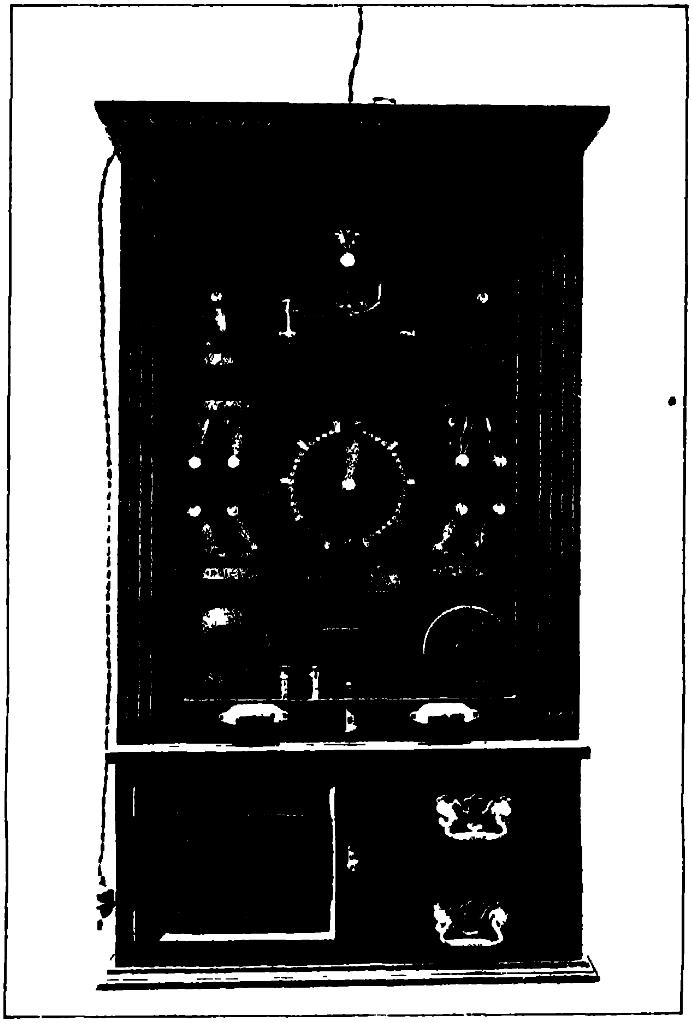

Fig 53.—Electrical cabinet for supplying from the street current galvanism, faradism, and cautery

cervix in cases of erosion. A large, flat sponge electrode must be provided if strong galvanic currents are used *in utero* For intra-uterine applications the greatest care must be exercised to secure perfect asepsis. Much unnecessary discredit has been cast upon electrotherapeutics in gynecology by carelessness in this respect. All electrodes for intra-uterine use must be sterilized by boiling water They should be made, therefore, of platinum, webbing, and bone or lava, so that they shall not be injured in sterilization. In time the webbing is destroyed, but it can easily

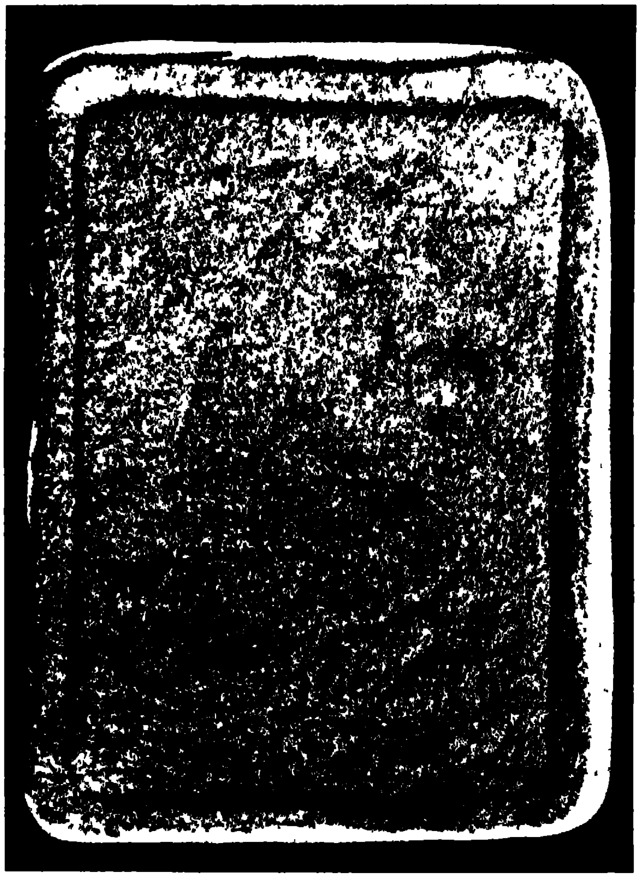

Fig. 54 —Large sponge electrode for the abdomen

be renewed To insert an intra-uterine electrode a bivalve speculum must be used, the cervix must be wiped off with pledgets of cotton soaked in sublimate solution, and the sterile electrode passed directly into the uterine cavity without touching anything but the blades of the speculum After an intra-uterine application the patient should remain at rest for half an hour or so, and should avoid much physical effort during the rest of the day. The electrical appliances should include a small cautery knife and cautery points for the removal or destruction of urethral caruncles and of venereal warts, which can be accomplished in office practice without inconvenience to the patient, by cocainizing the small growths and surrounding tissues before the cautery is used

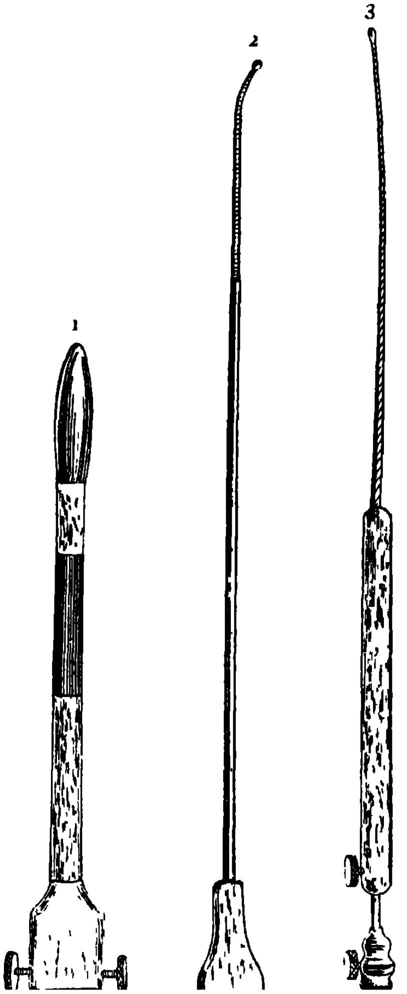

Fig 55 —1, Bipolar anal electrode, 2, bipolar electrode for intra-uterine faradism, 3, unipolar intra uterine electrode

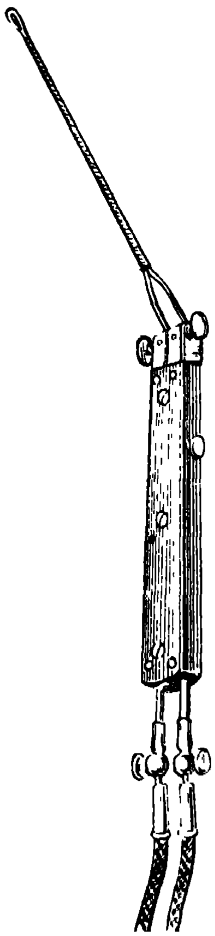

Fig 56 —Small cautery knife

PART II.

ANOMALIES OF DEVELOPMENT IN THE GENITAL TRACT.

THE whole genito-urinary tract of the female, from the ovaries to the entrance of the vagina and to the bladder and urethra, may be absent, in part or wholly, or may be subject to more or less serious developmental anomalies, disturbing or entirely abrogating the functions of the affected organs

The ovaries may be absent or ill developed. In the former case there is usually a deficient development of the whole genital tract. The gland itself may be of nearly normal size and in a normal situation, but the gland-contents, the Graafian follicles and ovules, may be absent, or the egg-cords of the fetal ovary may remain in their primitive condition The opposite anomaly of development by excess is not uncommon. Accessory ovaries immediately adjoining a normal ovary and included usually within the same epithelial envelope have been found postmortem and in operations. The ovary may be constricted so that it consists of two practically independent parts A true supernumerary ovary far removed in situation from its fellows is extremely rare. Winckel reports a case in which the supernumerary ovary lay between the uterus and the bladder. The possibility of accessory and of supernumerary ovaries must be taken into account in the operation of double oophorectomy Cases of persistent menstruation and even of conception after such operations may be thus explained

The Fallopian tubes show a number of developmental anomalies of interest to the scientific student, but of little importance to the practical gynecologist, except in their bearing on the etiology of tubal gestation Accessory fimbriated extremities are not uncommon, there may be three or more on the end of a single tube An accessory uterine orifice is also not extremely rare The duct of the tube may be duplicated, one canal commonly lying beneath the other. In connection with imperfect development of the whole sexual apparatus, the tubes may also be ill developed they may possess an abnormally small caliber, they may be solid, without any lumen at all, or they may be entirely absent On the contrary, the tube may show an abnormally great development with an anomalous patency of the canal, allowing the easy passage of a sound or probe from the uterine cavity out toward the abdominal orifice of the tube, and likewise permitting the regurgitation of fluids into the abdominal cavity. This hyperplasia of the tubes is not uncommon in connection with the great development of the sexual apparatus under the stimulus of pregnancy. There is quite often a regurgitation of lochial discharge in small quantities into the peritoneal cavity with a sharp, transitory, non-septic peritonitis as a result. The tubes may be congenitally displaced, usually backward and downward into Douglas's pouch, occasionally forward and outward in an inguinal hernia. They may be obstructed by a congenital angulation, perhaps interfering with impregnation, or more likely retarding the passage of the impregnated ovule toward the uterus, and thus causing extra-uterine pregnancy.

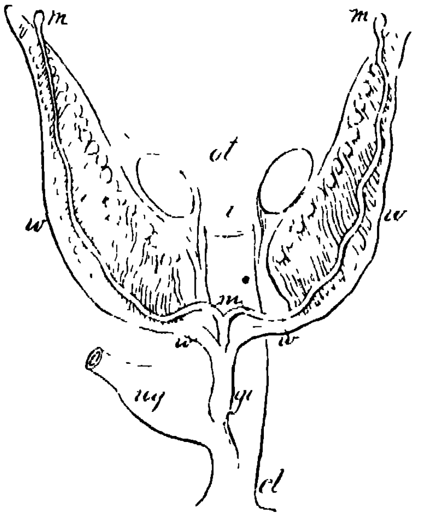

Fig. 57. Diagrammatic outline of the Wolffian bodies and their relation to the ducts of Muller and the reproductive glands. *ot*, Seat of origin of ovary or teste . Wolffian body, *w*, Wolffian duct, *m*, *m*, duct of Muller, *ge*, genital cord, *ug*, urogenital sinus, *r*, rectum, *cl*, cloaca (from Allen Thompson).

The Uterus.—There are many congenital anomalies of the uterus. They follow, however, the well-defined lines which govern congenital deviations from the normal in the fetal and infantile body as a whole. Kussmaul and Furst first gave a full and clear explanation of the developmental anomalies affecting the uterus. To understand these anomalies it is necessary to refer briefly to its embryogenesis. It is formed by the junction and fusion of the ducts of Muller, accomplished in great part before the twelfth week of embryonal life. Until the twentieth week of the embryo's existence, however, there still remain distinct traces of the fusion of the two ducts, the uterus in this period being still distinctly bicornate. After the twentieth week, and during early infancy, the uterus presents the peculiarities of the so-called fetal uterus. The cervix is much more developed than the corpus, and the mucous membrane of the cervical canal and of the uterine cavity is thrown into numerous folds. After the sixth year the fundus and body of the uterus have obviously attained considerable growth in comparison with the cervix, though there is nothing like the preponderance over the latter that occurs with puberty.

All the important developmental anomalies of the womb depend upon an arrest of development, and the nature of these anomalies depends in great part upon the time at which the development of the womb was arrested. If there is an arrest of the fusion of Muller's ducts before the twelfth week, a duplicity of the uterus must result. If the arrest of fusion in the two canals occurs after the twelfth week, a bicornate or a septate uterus is the result. If the disturbance of development occurs at a later period, the womb retains a fetal or an infantile character, without longitudinal separation or distinct indication of the duplex manner of its formation If the arrest of development affects the womb at a very early period, there may be simply a rudimentary bundle of muscles and connective-tissue fibers to indicate its situation, and in extraordinary cases there may be an entire absence of the organ

Absence or Rudimentary Development of the Uterus.—Complete absence of the womb is extremely rare, although an examination during life may fail to detect the slightest sign of its existence After death is found an indication, at least, of its presence in a ribbon of muscle or connective tissues stretched across the pelvis (Fig. 58), or, as in one case, in a mass of muscular substance on the posterior wall of the bladder (Fig 59).

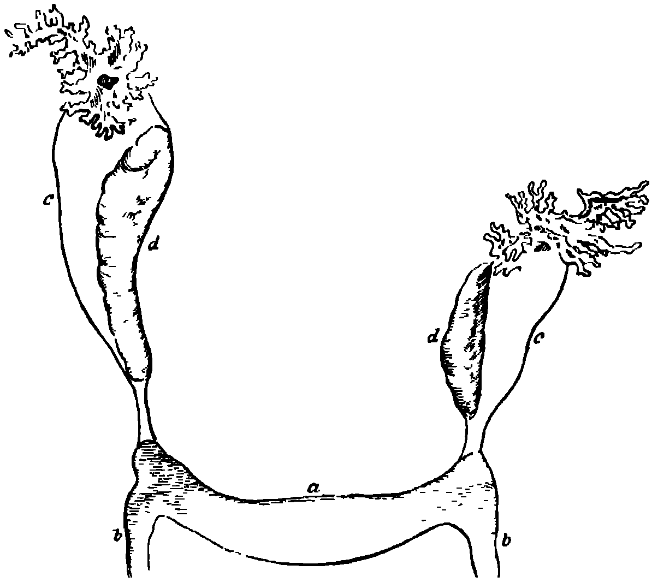

Fig 58.—Rudimentary uterus: *a*, Ribbon-shaped rudiment of uterus; *b*, *b*, round ligaments, *c*, *c*, Fallopian tubes, *d*, *d*, ovaries.

A rudimentary development of the uterus is not common. There may be a solid muscular body of small size without a cavity, or a shallow canal leading part-way into the uterine substance. More commonly in cases of arrested development the uterus retains in adult life its fetal or infantile character. A distinction is often drawn between the fetal and infantile uterus, but for practical purposes it is unnecessary.

Non-development of the uterus is commonly associated with acute anteflexion and with imperfect development of the nervous system. A very large proportion of hysterical and neurasthenic women possess an infantile uterus. Usually the tubes and ovaries are likewise ill developed, but occasionally the ovaries are perfectly normal in anatomical development and in physiological function,—an unfortunate condition,—for the periodical activity of the ovaries and the congestion of the pelvis are unrelieved by an adequate menstrual discharge from the infantile uterus, and individuals thus affected suffer severely at each menstrual epoch. Oophorectomy is indicated if the woman is disabled by the severity of the menstrual molimina. Women with ill-developed uteri may show no indication of the defect in their general appearance, but it is more common to observe ill development of the whole organism, a small stature, a slight frame, a feebly resisting nervous system, and a lack of mammary development.

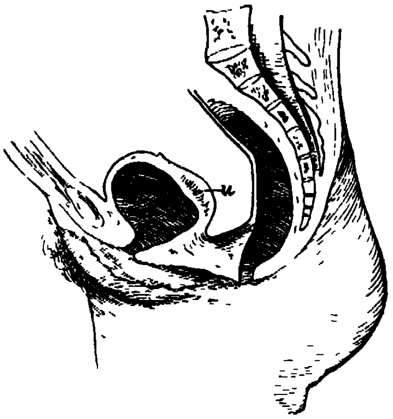

Fig 59 —Rudiment of uterus on posterior wall of bladder. *u*, Uterus.

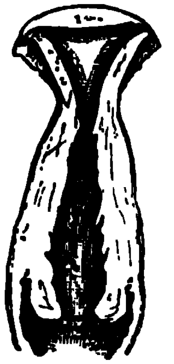

Fig 60.—Infantile uterus

The local treatment of an ill-developed uterus is unsatisfactory If, however, it is not too marked in degree, some advantage is occasionally derived from the use of the faradic current and the negative pole of the galvanic current applied in the uterine cavity; but in the majority of cases the sterility and the scanty menstruation for which the patient consults her physician must be pronounced incurable. Occasionally a cure is effected by repeated conceptions The uterus does not expand sufficiently at first to permit the growth of a fetus to term, and there are repeated miscarriages until the fourth or fifth pregnancy, which may go to full time.

Arrested Development of One of the Ducts of Muller (Uterus

Unicornis).—There may be an arrest of development or a failure to appear on the part of a Muller's duct, with the consequent formation of but one side of the womb and a development of but one Fallopian tube Both ovaries may be present It is more

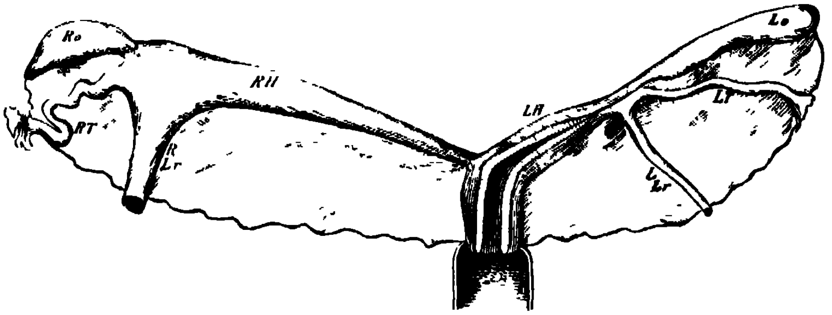

Fig 61 —Uterus unicornis. *LH*, Left horn, *LT*, left tube, *Lo*, left ovary; *L Lr*, left round ligament, *RH*, right horn; *RT*, right tube, *Ro*, right ovary, *R Lr*, right round ligament

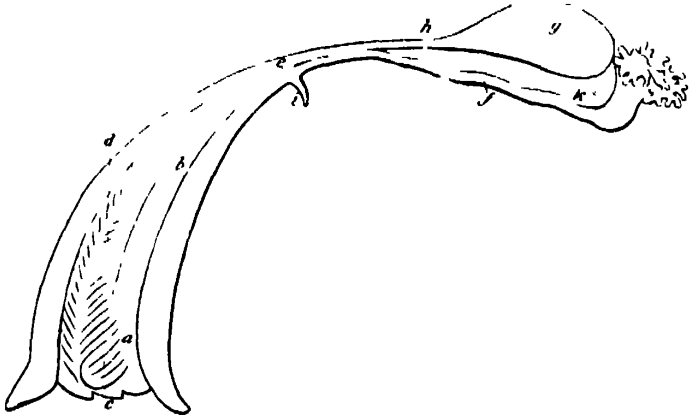

Fig 62 -Ill developed uterus unicornis *a*, Cervix *b*, fundus, *c*, *d*, longitudinal axis of uterine body, *e*, cornu, *f*, tube, *g*, ovary, *h*, ovarian ligament; *i*, round ligament, *k*, parovarium

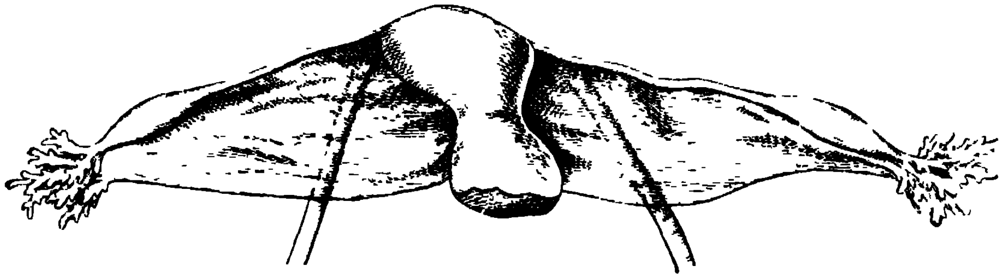

Fig 63 —Ill development of right side of uterus; congenital lateral flexion

common to see an indication of an ill-developed Mullerian duct on one side in the shape of a solid muscular band which runs outward to the insertion of the round ligament (Fig 61). The unicorn uterus is situated entirely on one side of the axis of the pelvic cavity, and it inclines sharply toward the corresponding pelvic wall. There is no uterine fundus, and the uterine body ends in a cone-shaped projection in which is inserted the Fallopian tube. In slight degrees of arrested development on one side the uterus may show a lateral flexion toward the undeveloped side. These conditions do not call for gynecological treatment They are only detected, if recognized at all, in the course of a pelvic examination for suspected pregnancy or for pelvic pain The situation of the uterus on one side of the pelvis may lead to the mistaken diagnosis of tubal gestation If the unicorn uterus is displaced and adherent it may be taken for a pus-tube

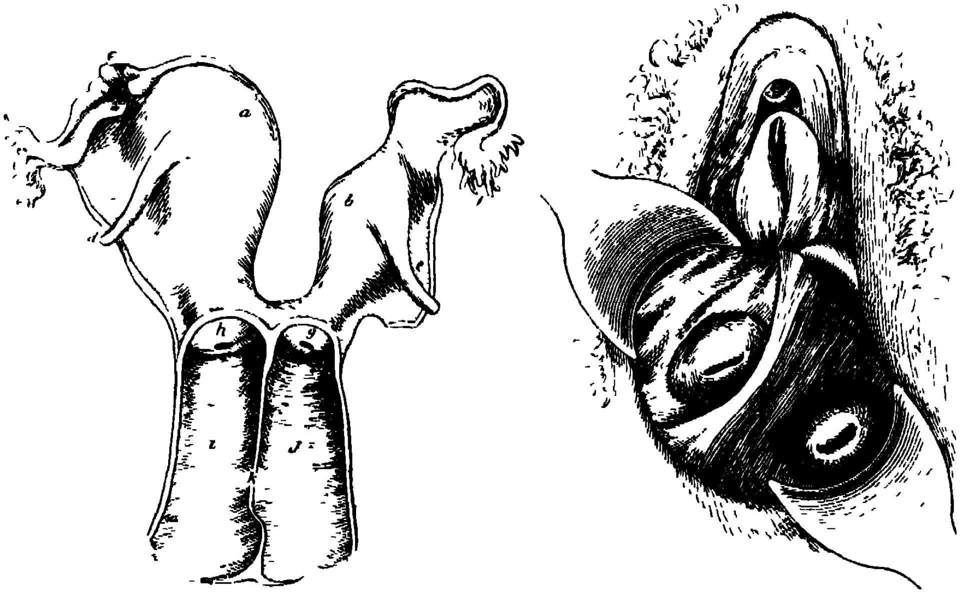

Fig 64. Fig 65

Figs 64 and 65.—Uterus didelphys · *a*, Right segment; *b*, left segment, *c*, *d*, right ovary and round ligament; *f*, *e*, left ovary and round ligament, *g*, *j*, left cervix and vagina; *k*, vaginal septum, *h*, *i*, right cervix and vagina.

Arrested Fusion of the Ducts of Müller. Uterus Didelphys; Double Uterus.—Occasionally the ducts of Muller remain entirely apart from each other in the whole course of their development, the failure of union resulting in the formation of two distinct uterine bodies, without even external junction. There are two cervices and two distinct vaginal canals, though the latter always lie in juxtaposition to each other (Figs. 64 and 65) It was thought at one time that this was an extremely rare variety of duplex formation in the uterus, but by a more careful examination of patients during life, and a more careful observation of specimens postmortem, the number of these cases has lately grown considerably, and it is a question if many of the

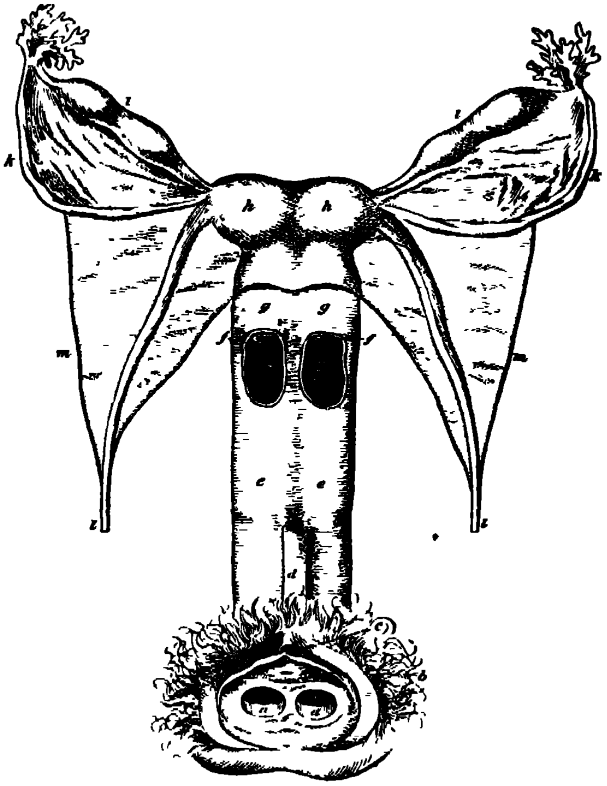

Fig. 66 —Uterus bicornis duplex : *a*, *a*, Double entrance to vagina , *b*, meatus urinarius , *c*, clitoris ; *d*, urethra ; *e*, *e*, double vagina , *f*, *f*, external orifices of uterus , *g*, *g*, double cervix ; *h*, *h*, bodies and horns of uterus ; *i*, *i*, ovaries ; *k*, *k*, tubes ; *l*, *l*, round ligaments ; *m*, *m*, broad ligaments.

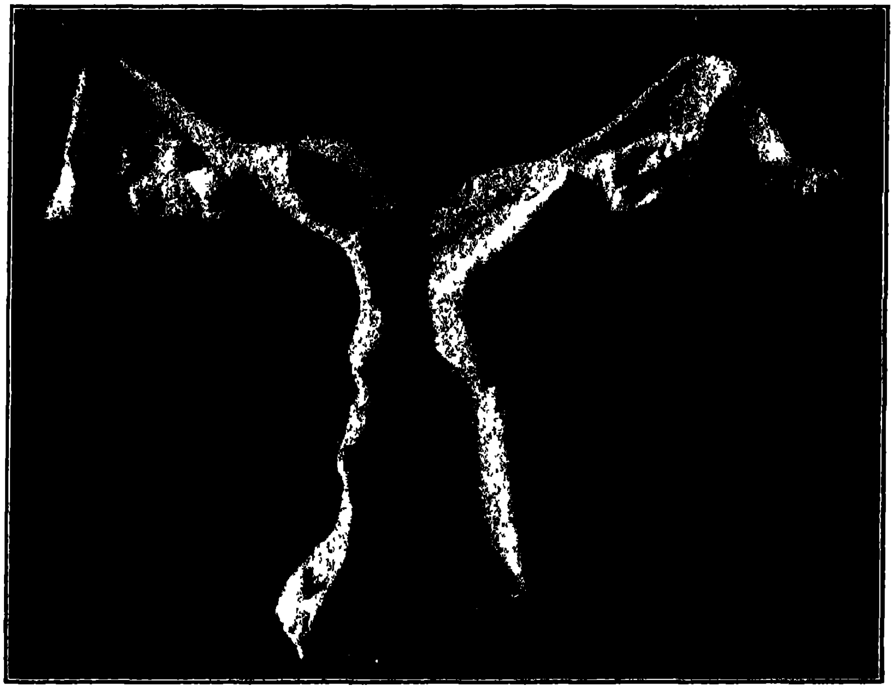

Fig. 67.—Uterus bicornis unicollis (Hodge collection, Univ. of Penna.).

examples of uterus bicornis should not be included under the heading of double uterus or uterus didelphys

During life the diagnosis of complete separation of the two uterine bodies can be made by the introduction of the sound into each and the observation that one moves entirely independently of the other. Bimanual palpation may also furnish the same information.

Uterus Bicornis Duplex.—The two bodies of the uterus are in juxtaposition and are connected externally, but remain internally distinct and apart through their whole length, and are joined externally not so much by muscular tissue as by their peritoneal investment and connective tissue There are two distinct uterine cavities, two cervices, and a double vagina

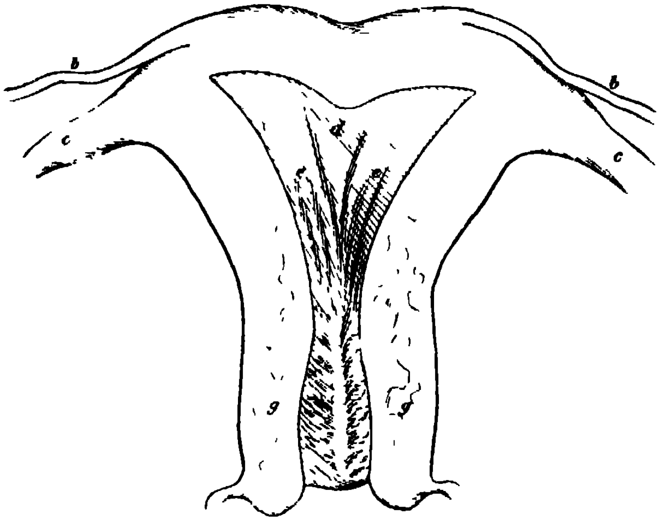

Fig. 68 --Uterus cordiformis · *a*, Indented fundus , *b*, *b*, tubes , *c*, *c*, round ligaments , *d*, central longitudinal ridge on posterior wall of uterine cavity , *e*, *e*, lateral ridges of same , *f*, internal os , *g*, *g*, cervix

Uterus Bicornis Unicollis (**Bifid Uterus**).—The junction of the two ducts is quite intimate below, so that there may be a single cervix without a dividing septum , but directly above the two uterine halves diverge sharply from each other It may not be easy to recognize this condition during life, but it is possible to do so by a careful bimanual examination, followed by the use of the uterine sound, which detects the divergence of the uterine canals. If the bifid uterus is retroverted and firmly fixed by inflammatory adhesions, it may be taken for a double pyosalpinx

In **uterus cordiformis** the fundus is broad, and the uterus has a conventional heart shape Associated with this external appearance there may be a longitudinal septum within the uterine cavity

Uterus incudiformis is an exaggeration of the uterus cordiformis without the median depression in the fundus. The upper portion of the uterus is expanded laterally, so that the whole organ has the shape of an anvil.

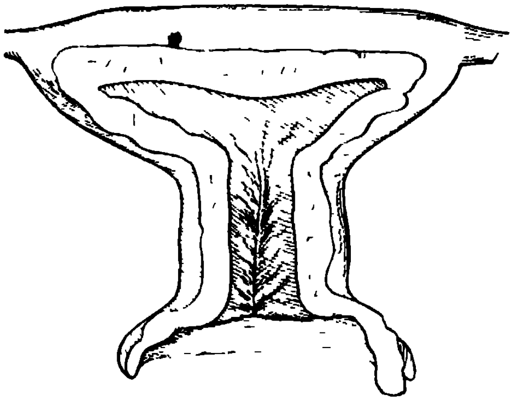

Fig 69 —Uterus incudiformis

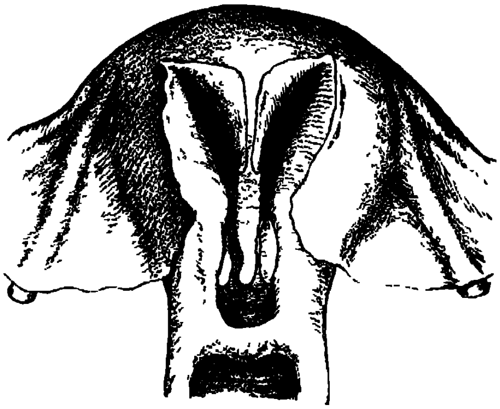

Fig 71.—Uterus septus (Greuzel).

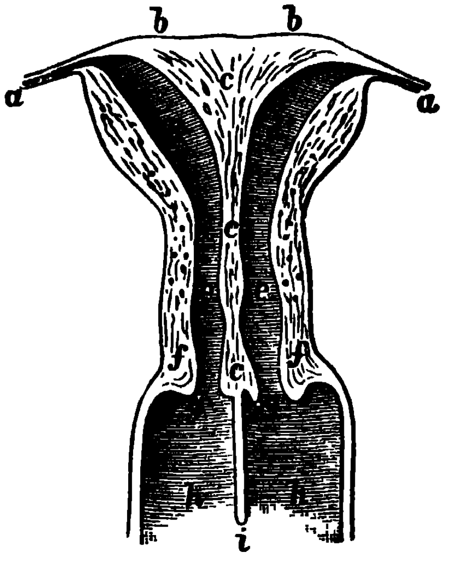

Fig. 70 —Uterus septus: *a*, *a*, Tubes, *b*, *b*, fundus uteri, *c*, *c*, *c*, septum, *d*, *d*, the cavities of the two uteri, *e*, *e*, internal os, *f*, *f*, external wall of the two cervices, *g*, *g*, external orifice; *h*, *h*, vagina, *i*, vaginal septum

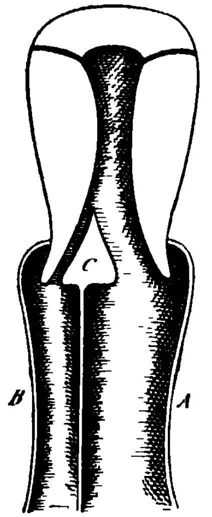

Fig 72 —Schematic drawing of double vagina and single uterus *A*, Left vagina, *B*, right vagina, *C*, cervical septum

Uterus Septus, Subseptus, Partitus, Semi-partitus.—With or without any external manifestation of imperfect fusion of Muller's ducts, there may be in the interior of the uterus a longitudinal septum dividing the cavity in whole or in part The two divisions of the womb in a uterus septus are commonly of unequal size or development. One is usually smaller and less developed than the other.

The vagina is divided by a longitudinal septum in cases of uterus didelphys, uterus bicornis duplex, and sometimes in uterus subseptus. The vagina and cervix (uterus biforis) may be divided longitudinally without division of the uterine cavity.

Anomalies of Development in the Cervix.—The commonest developmental anomaly in the cervix is a stenosis of the canal and of the external and internal os, associated frequently with a small and conical cervix, and often with an undersized and anteflexed uterus. The narrow cervical canal and the angle of flexion in the lower uterine segment directly above it oppose a mechanical obstacle to the escape of blood at the menstrual period For the first few years after puberty there may be very little pain, but as the menstrual flow increases, there is greater difficulty in its discharge, the disturbance of the uterus, its distention, and the violent muscular action required to expel the blood irritate the lining membrane, which in time becomes chronically congested This condition leads to a sudden onset of menstruation, with a more profuse flow, which, of course, increases the difficulty, and so a vicious circle is established that causes greater suffering at each period, intermenstrual pain, and at length a complete nervous breakdown (See Dysmenorrhea)

Atresia of the Cervix.—Congenital atresia of the cervix may have its seat at the internal or at the external os, or it may affect the whole canal It is not discovered until after puberty and the institution of menstruation If there is no associated anomaly of the uterine body or ovaries, the menstrual molimina appear regularly and become more painful without the discharge of blood from the genitalia By a bimanual examination the physician detects a spherical cystic tumor in the pelvis, occupying the position of the uterus. By a specular examination the closure of the external canal and the distention of the cervix may be seen, or if the atresia is higher up it is detected by a sound. Exceptionally there is no attempt at menstruation, and occasionally the menstruation is vicarious.

The *diagnosis* of congenital atresia of the cervix is easily made It is impossible to pass a sound through the cervical canal If there has been an accumulation of menstrual fluid or of mucus within the womb, the latter is converted into a cystic tumor with rather thick walls, and on both sides of it there may be enlarged and distended tubes In atresia at the internal os the external form of the cervix is well preserved. In atresia at the external os the cervix is practically obliterated and becomes continuous with the vaginal vault By digital examination it is impossible to detect the cervix, but upon inspection through a speculum it is indicated by a slightly projecting nipple in the middle of the vaginal vault, and the seat of the external os is marked by a shallow dimple. Landau and Pick [1] report a case of congenital gynatresia in which the cervix was replaced by an imperforate adenomyoma derived from the Wolffian body.

(For the *treatment* see Hematometra.)

Arrested Development of the Cervix.—The cervix may be undeveloped in common with ill development of the uterus or of the whole genital apparatus. Occasionally the cervix alone is affected, and in exceptional instances the whole vaginal portion may be lacking, while the rest of the genital canal is well developed. In these cases the vagina passes directly into the uterine cavity by a small constricted opening It is easy to confound with this condition a congenital stenosis of the upper third of the vagina, in which the canal is suddenly reduced to a small sinus barely admitting the uterine sound, or a transverse perforate septum in the vagina

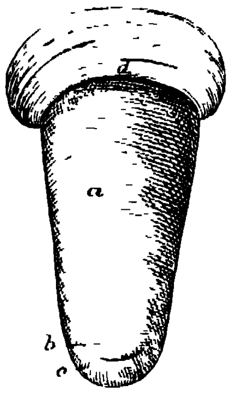

Fig 73.—Hypertrophic elongation of the cervix: *a*, Cervix, *b*, *c*, anterior and posterior lips, *d*, uterine body

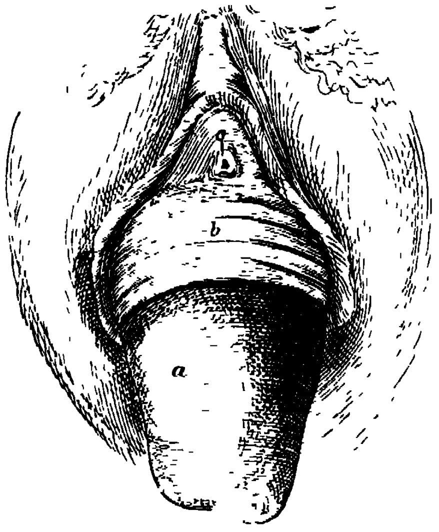

Fig 74—Hypertrophic elongation of the cervix and prolapsus. *a*, Cervix; *b*, uterine body, *c*, meatus

Hypertrophy of the Cervix.—The vaginal portion of the cervix occasionally shows marked hypertrophy, presumably of congenital origin. There is no inversion of the vaginal mucous membrane, yet the cervix reaches to and projects beyond the vulva. It has a conical shape, with a broad base, but that portion of it which appears between the labia has a normal appearance in shape and size. There is no ulceration around the os, no marked increase in the transverse diameter; in short, there are none of those changes which are common when the cervix is prolapsed in consequence of inversion of the vaginal walls and supravaginal elongation, the latter being usually due to some of the injuries of childbirth, and having no place among the congenital anomalies of this region. Hypertrophy of the infravaginal portion of the cervix is more common in negresses than in white women.

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[1] "Arch. f Gyn," Bd lxiv, H 1.

The *treatment* is amputation of the cervix at the level of the vaginal vault. (See page 210.)

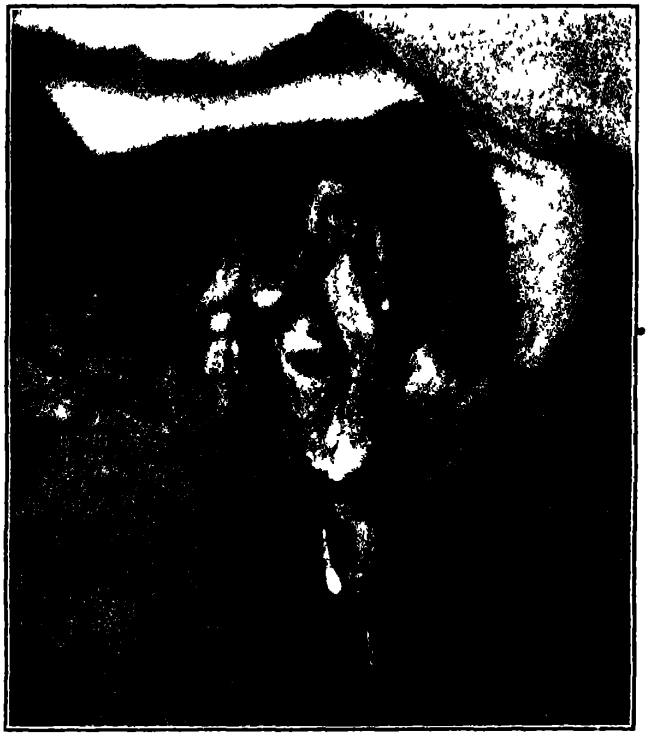

Fig 75 —Congenital absence of the vagina

The vagina may be absent or indicated only by a rudimentary cord of connective tissue This condition may be associated with an absence of the whole internal genitalia, while the external genitals may present a perfectly normal appearance If the uterus and ovaries are well developed, the absence of the vagina gives rise to serious trouble as soon as menstruation begins. The menstrual fluid collects within the womb, accumulating also in the tubes, which before long threaten to rupture. By a bimanual examination of the rectum and abdomen, the distended uterus and the tubes may be detected high up in the pelvic cavity or above it. The thickness of the tissue representing the vagina, or the entire absence of such tissue, can be determined by a sound in the bladder and a finger in the rectum A passageway must be opened for the escape of the retained menstrual blood by making a transverse incision in the perineum between the rectum and the urethra, and then a blunt dissection upward until the cervix is reached. The rectum and bladder are guarded from injury by a bougie in one and a sound in the other. The uterus, when it is reached, is punctured with a trocar and the thick sanguinolent fluid is allowed to escape slowly,

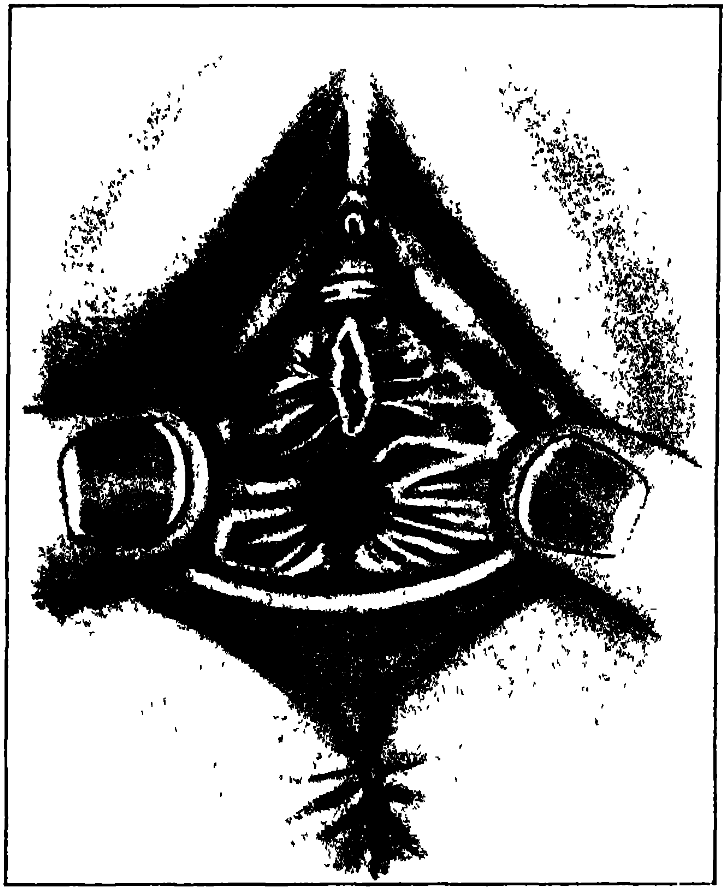

Fig 76 – Congenital absence of the vagina.

long-continued irrigation of the uterine cavity with boracic acid solution and packing with iodoform gauze following the evacuation of the uterus. If the tubes are distended, an abdominal section and their removal should precede the vaginal operation The numerous fatal cases of peritonitis following operation for gynatresia are due to the putrefaction of the fluid in the distended tubes or to their rupture. The artificial vagina is kept open with great difficulty after such an operation. The best means is to transpose a flap of skin from the labia majora or buttocks into the vagina, sewing the ends, if possible, to the cervix. Persistent and frequent dilatation with cylindrical dilators must follow. In spite of all these efforts, however, the artificial opening may close again, or may become so contracted as to oppose a serious mechanical obstacle to the escape of the menstrual fluid. It may be possible to use packing persistently, or to insert a metal, hard-rubber, or glass tube (Sims' plug) which shall be continuously worn. In one case, quoted by Pozzi, temporary success was attained, after making the artificial vagina, by electrolysis.

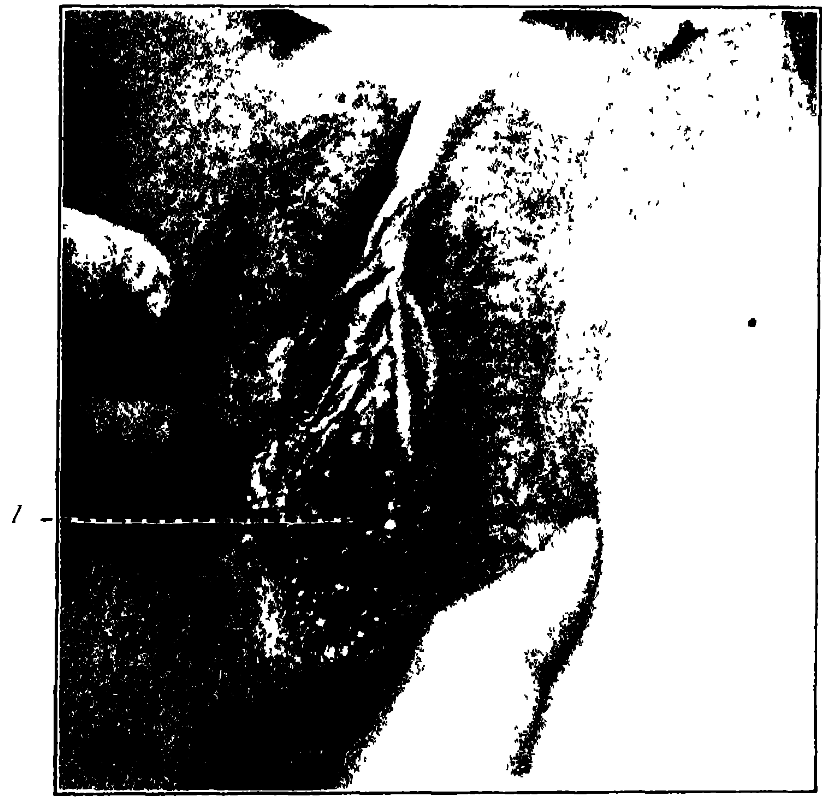

Fig. 77.—Implantation of the vagina. *l*, Mucous membrane from a case of prolapsus uteri implanted in a woman with congenital absence of the vagina (Howard Hospital).

If there is absence or non-development of the uterus, so that menstruation does not occur, it is usually unjustifiable to make an artificial vagina simply to permit copulation. The mere making of the artificial vagina is easy enough (see page 144). Should there be well-developed ovaries with absence of the vagina and uterus, so that there are menstrual molimina, associated with great pain and nervous distress, oöphorectomy may be called for. In a few cases of absent vagina and uterus there has been vicarious menstruation, the blood being discharged from the mucous membranes

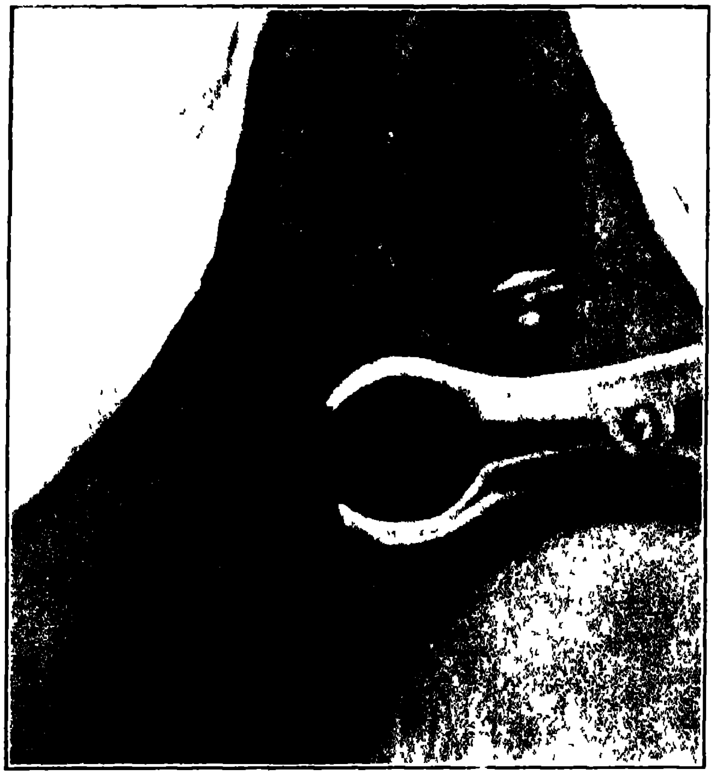

Fig 78 —Three weeks after operation for artificial vagina and implantation of vaginal mucous membrane. Speculum inserted three inches

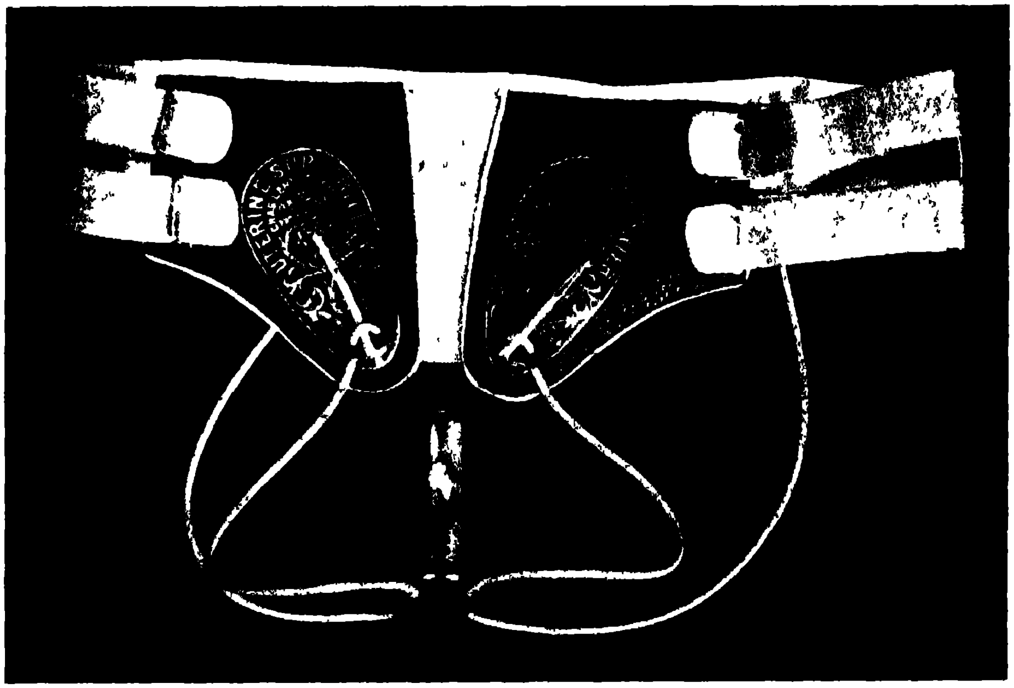

Fig 79.—Silver plug (Sims') supported by abdominal belt and rubber bands

of the stomach and of the lungs, and in one case through the skin of the extremities.

Occasionally the vagina is absent in only a part of its course, being reduced to a solid fibrous cord at about the middle. The menstrual fluid after puberty is retained, first distending the vaginal canal above the point of atresia, then dilating the uterine cavity, and finally the tubes. This condition is easily managed by operative treatment, the mucous membrane of the upper vagina being united to that of the lower canal. Atresia of the vagina may result if the depression between the labia fails to unite with the vaginal canal in embryonal development The two passageways impinge upon each other, but the barrier between them fails to melt away as it should In such a case the urogenital fissure is much deeper than common, but the accumulated fluid behind the barrier which prevents its escape is within easy reach and its evacuation is attended with no special difficulties. After making a free opening or, if necessary, a dissection upward to reach the vaginal canal, the mucous membrane of the vagina may be pulled down and stitched to the skin of the vulva.

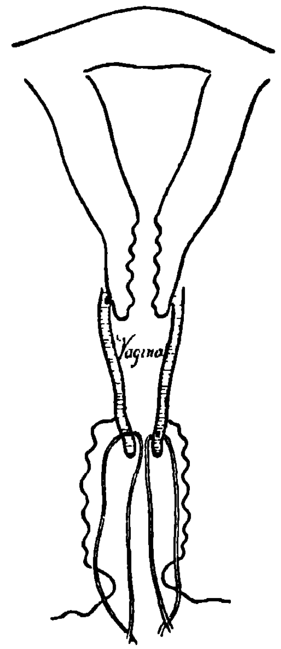

Fig 80 --Stitching vaginal walls to external skin (Kelly)

Unilateral Vagina.—It sometimes happens that one of the two Muller's ducts which, when fused together, constitute the normal vagina, fails to develop entirely, and the vagina is formed by the growth of but a single duct. It is doubtful if a unilateral vagina ever occurs except with a unicorn uterus. The vaginal canal is much narrower than common, and may be situated to one side of the median line

Double Vagina.—There may be a failure of fusion of the two Muller's ducts in their lower portions, as there is a failure of fusion above in the different forms of double or septate womb. The septum of the double vagina is so arranged that one canal is somewhat anterior to the other The septum usually extends the whole length of the vagina and is often associated with a double hymen In some cases, however, the septum may be lacking in part The hymen may be single, and there may be a considerable space between it and the commencement of the vaginal septum. Occasionally the double vagina is asymmetrical, one of the canals being larger and better developed than the other. In such a case the smaller canal may be closed at its lower end. After puberty a lateral hematocolpos may appear if the undeveloped vaginal canal is connected with one side of a double uterus

A double vagina is often overlooked. In the case of lateral hematocolpos from atresia of one side of a double vagina, the diagnosis may be difficult, and is made only after a careful bimanual and rectal examination, and possibly only after a free incision into the vaginal wall and the evacuation of the accumulated fluid.

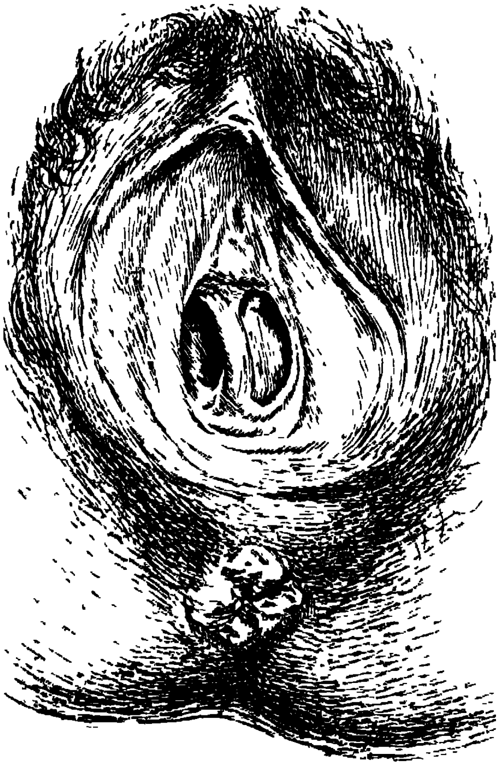

Fig. 81.—Double vagina.

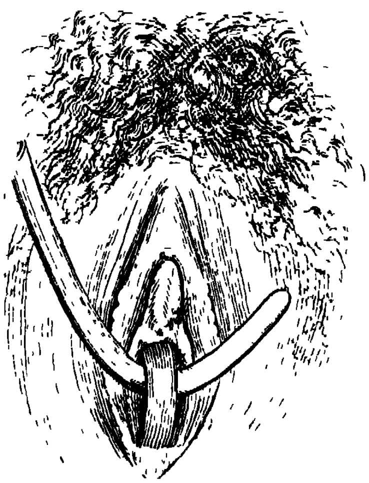

Fig 82 —Longitudinal band dividing vaginal orifice

Stenosis of the Vagina.—There may be narrowing of the whole vaginal canal associated with ill development of the entire genital tract Occasionally the vagina in its upper third is reduced to a small sinus no larger than a cervical canal, the vagina suddenly ending at a distance of an inch or more below the cervix The vagina may likewise be obstructed by transverse folds of mucous membrane and connective tissue, in some cases simulating a second hymen high up in the canal, in others taking the form of thick, fleshy, transverse bands.[1] Occasionally these bands run anteroposteriorly

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[1] The author has seen two cases lately in which the vagina ended apparently in a normal vault about two-thirds the way up To the left of the median line was a slit into which the forefinger could be passed Beyond this point the vagina again expanded into its proper width, with the cervix projecting normally from its vault

The Vulva.—At the end of the first month of the embryo's existence a depression is developed in the caudal region, growing deeper toward the allantois and opening into the latter, and consequently into the intestines, to which it is joined, constituting the common opening, the so-called cloaca. A few days later the first indication of the sexual organs appears in the shape of a slight eminence above the cloaca, and on either side of this eminence appears a fold of skin. In the course of the next two weeks the wall partly separating the intestines and allantois grows downward into the cloaca, and, being met by a process from the external skin growing upward, forms the perineum and divides the genital from the intestinal canal. The genital eminence becomes later the clitoris; the folds of skin on either side, the labia majora. Within these are developed the nymphæ or labia minora. Anteriorly the urethra is now formed, and a septum divides the urinary from the genital tract. The ducts of Muller descend, making the urogenital sinus, as the common external opening is called, more shallow.

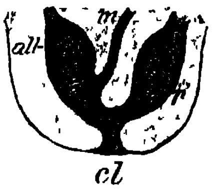

Fig 83

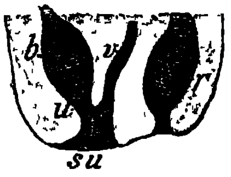

Fig 84

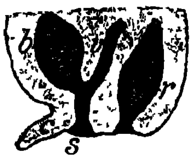

Fig 85

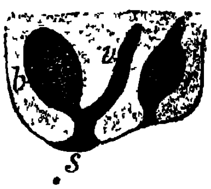

Fig 86

Fig 83.—*cl*, Cloaca which has opened into primitive hind-gut, and communicates with the rectum and allantois; the posterior portion, *all*, of the latter has commenced to dilate to form the urinary bladder, *m*, duct of Muller, *r*, rectum.

Fig 84.—The cloaca has divided into a ventral portion, *su*, the urogenital sinus, which communicates ventrally with the urethra, *u*, and the bladder, *b*, and more dorsally with *v*, the vagina, formed by fusion of the ducts of Muller, *r*, rectum.

Fig 85.—The perineum or tissues separating the rectum from the urogenital sinus are well developed, the neck of the bladder has become constricted to form the primitive urethra, and is separated from the vaginal passage, though both open into the common urogenital sinus, *s*, and the clitoris, *c* (in the male the rudiment of the penis), has appeared; *r*, rectum.

Fig 86.—The urogenital sinus of the female, *s*, remains as the cleft between the sides of the external aperture of the labia minora, it communicates in front with the bladder, *b*, and dorsally with the vagina, *v*, *r*, rectum.

Atresia of the Vulva.—Very rarely there is an entire absence of the successive steps in development by which the urogenital sinus is formed, and the skin is stretched evenly and unbroken from the pubes to the coccyx and from one tuberosity of the ischium to the other. There is complete atresia of the vulva and of the anus. Such a fetus is non-viable.

Arrested Development of the Urogenital Sinus.—An arrest in the development of the urogenital sinus occasionally results in a persistence of the conditions that existed at the stage of embryonal development when the openings of the intestine, bladder, and genital tract were common and unseparated. There may be thus hypospadias in the female, which is, however, very rare, or more commonly an anomalous opening of the bowel in the fossa navicularis. To this condition the name of atresia ani vaginalis is commonly given, a name not strictly accurate, for there is, of course, not a complete atresia of the anus, but simply an abnormal position. Rarely there may be, coincident with this abnormal opening of the bowel, a patent anus in the normal situation.

Hyperplasia and Hypertrophy of the Vulva.—Hypertrophy of the labia majora is rare. The author has seen but a single example, in which the labia projected an inch and a half from the surrounding skin and measured each one inch and three-quarters transversely. Supernumerary development of the labia minora is likewise rare. Both these conditions are of interest to the scientific student, but call for no gynecological treatment Hypertrophy of the labia minora is a more common condition. It is found normally in certain races, as the Hottentots, and is occasionally seen in Caucasian women. If the hypertrophied nymphæ are irritated and inflamed, so that locomotion is difficult, or if they interfere with coitus, they should be excised.

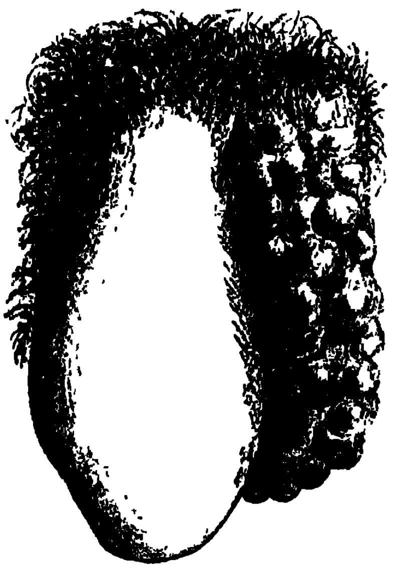
Fig. 87.—Hypertrophy of the clitoris.

Ill Development of the Vulva.—If the internal genitalia are defective, the labia majora and minora may be small and flat, the introitus vaginæ shallow and narrow the mons veneris not prominent and poorly provided with hair. On the other hand, with entire absence of the vagina and uterus, the external genitalia may be perfectly developed.

Hypertrophy of the Clitoris.—The clitoris is sometimes hypertrophied to the size of a penis. If the overgrown organ interferes with coitus, or if it becomes easily inflamed or irritated and causes the individual decided discomfort, the redundant portion should be amputated. Nothing is gained by the amputation of the clitoris for nymphomania or for masturbation. To the discredit of gynecology, this operation obtained considerable favor for a time by the enthusiastic advocacy of Baker Brown and a few indiscreet followers. It is now known to be useless.

Anomalies of the Hymen.—The hymen is normally a delicate annular membrane at the outlet of the vagina, with a central perforation into which the tip of the little finger can be inserted. There are, however, many variations of form and orifice. The latter may be crescentic, with the concavity closely embracing the urethra. There may be two symmetrical openings side by side or the orifices may be punctate and numerous (cribriform hymen). The edge of the hymen may be dentated, looking as though it had been ruptured by coitus, or it may be apparently irregularly carved out of thickened tissue (sculptured hymen). The orifice may be exceedingly minute, or the membrane may be imperforate, causing, after puberty, hematocolpos and hematometra.

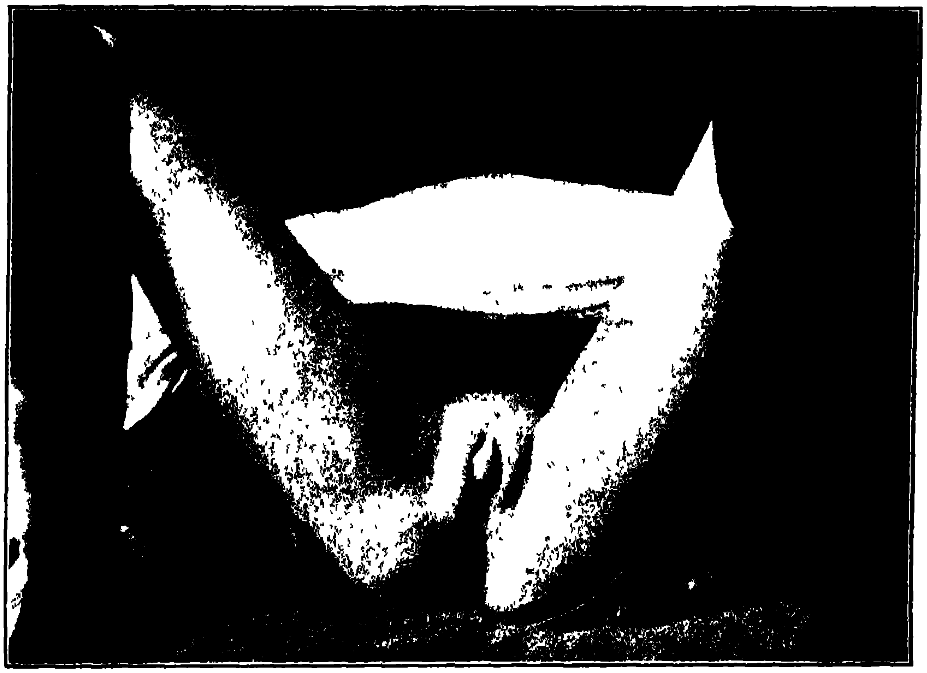

Fig 88.—Hypertrophy of the clitoris.

The hymen is occasionally hypertrophied , it may project beyond the labia majora one to three centimeters (Scanzoni) It is more commonly simply thickened, and opposes by its unnatural strength an insuperable barrier, perhaps, to coitus, but not necessarily to conception. In rare instances the hymen is so elastic that coitus does not rupture it, nor even the birth of a fairly well grown fetus. An unruptured hymen may be seen in a prostitute who has plied her trade for years, and Winckel quotes a case in which a five months' fetus was born without laceration of the hymen. In a few instances complete absence of the hymen has been noted, and it is occasionally represented merely by a few ill-developed papillæ.

Retention of Mucus and Blood within the Genital Tract in Consequence of Gynatresia (Hydrometra, Hematometra; Hematocolpos, Hydrocolpos; Hemelythrometra; Hematosalpinx).— As a result of atresia in any portion of the genital tract, either congenital or acquired, the secretions of the mucous membrane and the blood at the menstrual periods can not escape, and accumulate from time to time in spite of a certain amount of absorption that goes on between the periods.

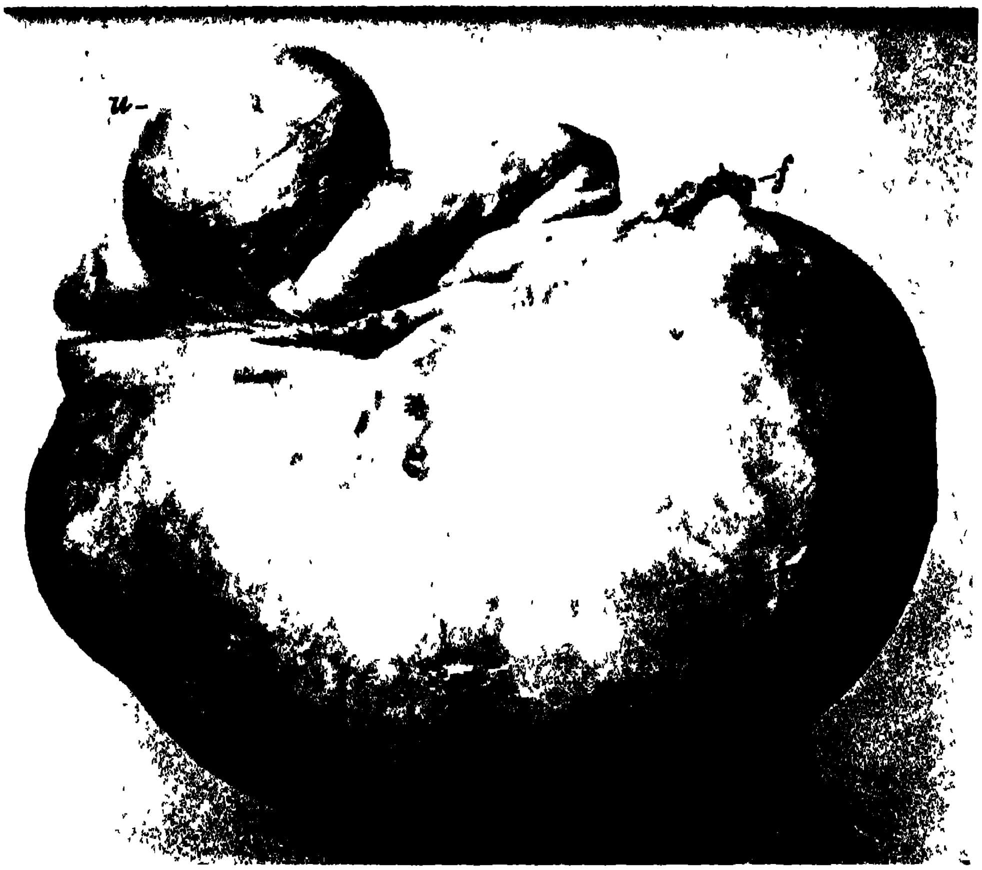

Fig. 89.—Uterus unicornis, with absence of cervix and vagina, enormous hematosalpinx, measuring 20 cm in its longest diameter *u*, Fundus of unicorn uterus, *f*, fimbriated extremity of tube.

In atresia of the cervix, the mucus from the endometrium and the blood of the menstrual periods after puberty accumulate steadily, first dilating the cervical canal and in time the uterine cavity, until large quantities of blood may be contained within the womb, thinning the walls perhaps to the tenuity of paper, or possibly being accompanied by an eccentric hypertrophy of the uterus and thickening of the walls. In the course of time, both in congenital and acquired atresia, there is an accumulation within the tubes (hematosalpinx) as well as within the uterine cavity (hematometra). The fluid in the tubes is derived not only from a regurgitation of uterine fluid, but also from the tubal mucous membrane. Communication between the tube and the uterine cavity may be shut off, proving conclusively the tubal origin of the accumulated blood. The fluid within the uterus and tubes is dark and thick

The symptoms of hematometra appear only after puberty There are at each menstrual epoch increasing pains of a cramp-like character and intense bearing-down efforts without the escape externally of blood. The patient herself or her friends commonly recognize the fact that there is a mechanical obstruction to the escape of the menstrual fluid In time, from irritation and congestion, an inflammation begins in the pelvis, and associated with the symptoms of retention of fluid within the uterus there are the symptoms of pelvic peritonitis. Suppuration within the womb or within the tubes may occur, converting the case into one of pyometra or pyosalpinx. Ordinarily the suffering is so extreme and the tumor of accumulated blood is so well marked within a few years after puberty that surgical intervention is required But cases are recorded of persistently recurring menstrual molimina and a steady accumulation of blood for more than twenty years before the patient was relieved by an operation. It is probable that the secreting mucosa of the genital canal undergoes a pressure atrophy in time and that the quantity of exuded blood diminishes from month to month

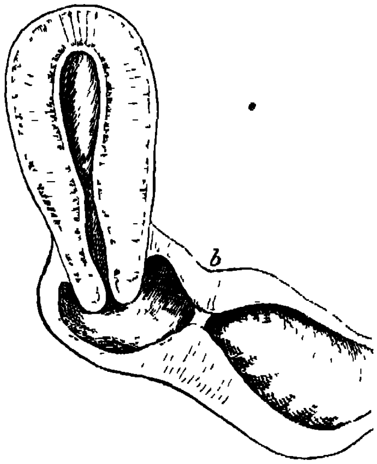

Fig 90 —Occlusion of the vagina *a*, *b*, Transverse septum

If the point of atresia is situated low in the genital canal, at the middle third or outlet of the vagina, the fluid accumulates first within the vagina (hematocolpos), and only after some time is there dilatation of the cervix, and at last of the uterine cavity (hemelythrometra), which commonly preserves for a long period an hour-glass form by the projection inward of the internal os In examining such a case the uterus may be felt as a solid body perched upon the cystic tumor, consisting of the dilated vagina and cervix. If the obstruction is an imperforate hymen there is in time a bulging outward of the membrane, protruding between the labia. In neglected cases, or in those in which a correct diagnosis has not been made, there is occasionally

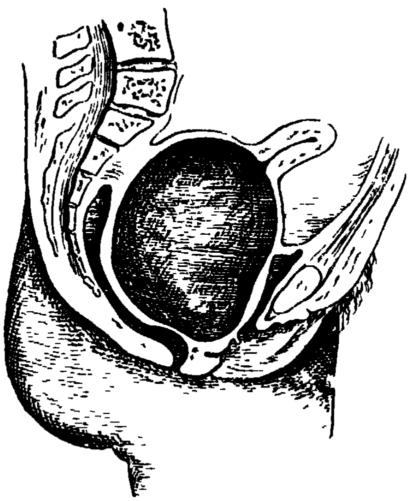
Fig 91 —Atresia of the vaginal outlet.

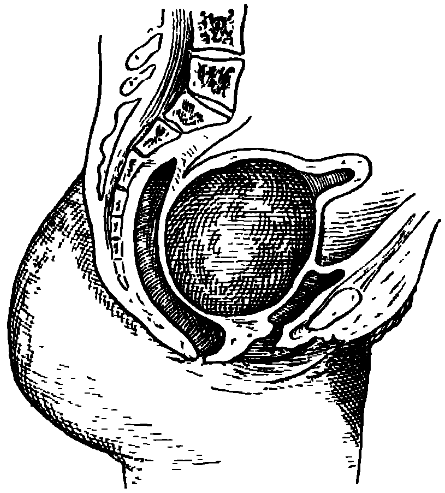
Fig 92 —Atresia of lower third of vagina

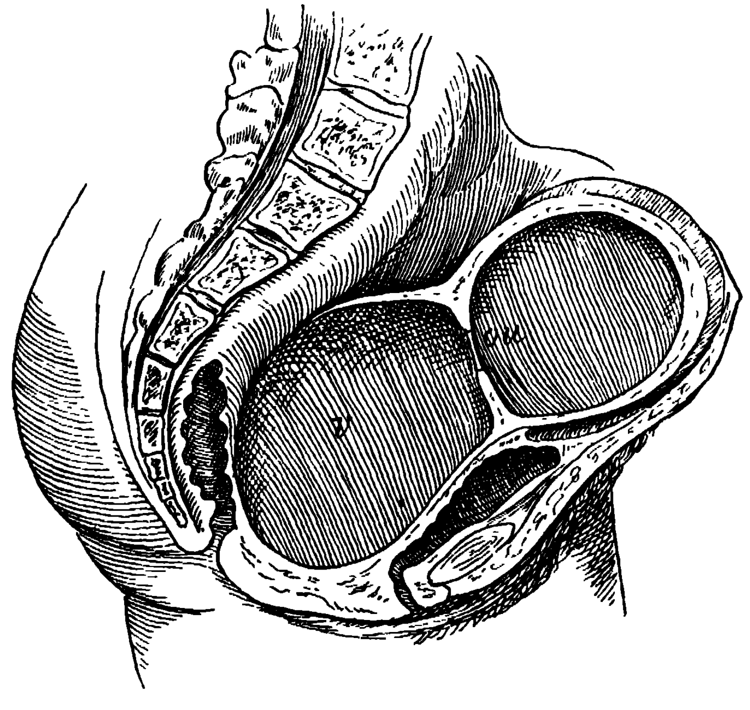

Fig. 93.—Atresia of the vaginal orifice; hematocolpos and hematometra: *v*, Vagina; *ou*, internal os.

a spontaneous evacuation of the fluid by a rupture at the seat of the atresia. These cases are very likely to end unfortunately; the fluid is not freely evacuated, and the portion that remains behind is extremely likely to become infected, the infection rapidly spreading to the tubes and thus to the peritoneal cavity, or to the lymphatic and venous channels of the uterine wall. Spontaneous rupture may likewise occur into the peritoneal cavity, either by a laceration of the tubal walls or by rupture of the uterus above its peritoneal attachment. This accident may

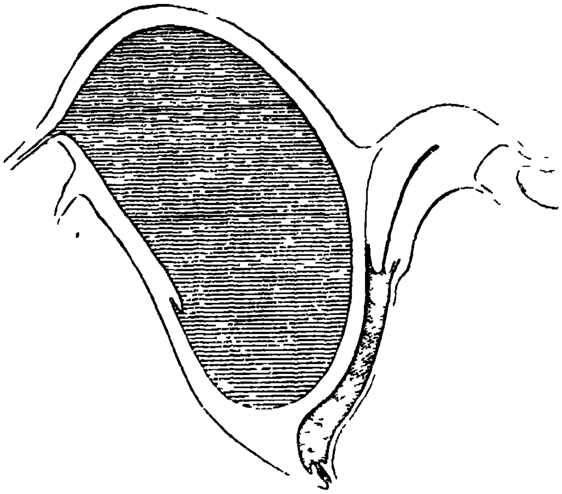

Fig. 94.—Unilateral hematocolpos and hematometra (Martin)

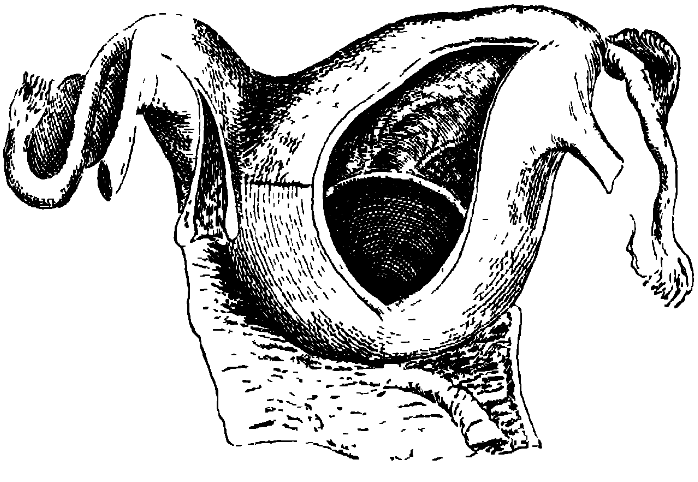

Fig. 95.—Lateral hematometra.

be followed by the rapid development of septic peritonitis. The author has seen a rupture into the bladder of a hemelythrometra due to acquired atresia of the vagina. In cases of double uterus and vagina it is not uncommon to find atresia on one side, with a consequent lateral hematometra or hematocolpos. Such cases are not so easy to recognize as those already described, but a careful examination should almost always avoid error. In hematocolpos, a cystic tumor is found occupying one side of the vaginal canal, and a bimanual examination may reveal the body of a uterus above it, while on the unaffected side, evidences of duplex formation in the womb may be apparent.

If the atresia affects one side of the uterus only in a case of septate or double womb, a cystic tumor may be detected directly alongside the normal half of the uterus and obviously intimately connected with it. A history of periodicity in the pain caused by accumulated fluids coincident with the menstrual period is also a help in the diagnosis. Finally, puncture of the obliterated half of the cervix verifies the presumptive diagnosis.

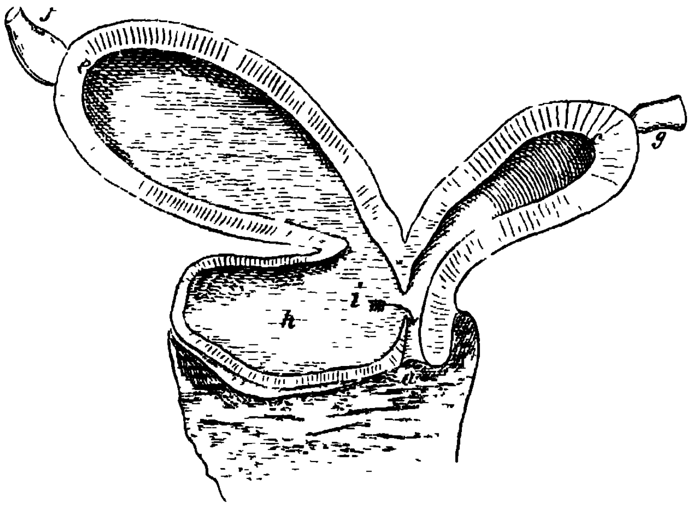

Fig 96.—Lateral pyometra, evacuated through patent cervical canal: *e*, *e*, Fundus; *f*, *g*, Fallopian tubes; *h*, cervical canal, dilated; *i*, opening into patent cervical canal; *a*, external os

The Treatment of Retention within the Genital Canal of Menstrual Blood and Mucous Discharge.—Before undertaking the evacuation of retained fluids in the genital canal the condition of the tubes must be ascertained by a combined rectal and abdominal examination. If they are distended, as they often are, the safest plan for the patient is the performance of an abdominal section and the removal of the tubes. If there is doubt as to the tubal condition, an exploratory abdominal section is indicated. No matter how carefully the point of atresia is punctured, or how cautiously and slowly the fluid is evacuated, or how scrupulously aseptic the operation may be, it is impossible to insure the evacuation from the tubes of the thick tarry blood they contain. Infection of the tubal contents is very probable, and a septic peritonitis is the result. The tubes, if they are distended or diseased, being removed, the site of the atresia may be punctured with a trocar, the opening enlarged by bougies or by a blunt-pointed bistoury, and the fluid in the vagina and uterus washed out or mopped out with pledgets of gauze. It is not difficult to empty the uterus and vagina completely, and as they are emptied their walls contract. The opening which has been made is maintained by a flap-splitting operation, transplantation of flaps from the labia, the insertion of a metal or glass tube, or repeated packing. If the point of atresia is the cervix, repeated dilatation of the canal with bougies may be required after the opening is made. It may be preferable to amputate the cervix above the site of the atresia, if possible, joining the mucous membrane of its canal to that of the vaginal vault by sutures

It may appear in the abdominal section to remove the tubes or to investigate their condition that the best course is the complete removal of the distended uterus, with the tubes (Fig. 89) If the accumulation of fluid is due to an imperforate hymen, or an atresia of the lower third of the vagina; if there is hematocolpos and some degree of hematometra, but the tubes are not involved, it suffices to make a crucial incision in the hymen, or a blunt dissection of the tissues obstructing the vaginal canal, letting the fluid escape slowly at first, and finally irrigating the genital canal through a reflux catheter with a warm boracic acid solution, continuing the irrigation until the canal is washed clean The vaginal canal, and the uterine cavity, too, if it is dilated, should be packed with iodoform gauze, thickly dusted with boracic acid powder The packing is renewed every twelve hours, and each time it is replaced the genital canal should again be irrigated

Hermaphroditism.—A true hermaphrodite, an individual with functionally active glands of both sexes, provided with excretory ducts, has not yet been discovered, and probably never will be In many instances true hermaphroditism has been claimed for an individual or a specimen, but very few indeed of these descriptions bear scientific criticism For examples:

The case described by Barkow, in which there was undoubtedly one testicle, without, however a vas deferens, and another body described as an ovary, which histologically was made up mainly of fat, connective tissue, and blood-vessels

The case of Berthold, in which there were a testicle in the right half of the scrotum, between the rectum and bladder a uterus unicornis, on the right side no adnexa, but on the left a round ligament, tube, and "ovary." The last lacked the characteristic histological elements of a normal ovary

The case of Banon, in which, on the left of the small uterus, there were a tube and an ovary, on the right a testicle with vas deferens. The ovary again, in this case, showed no Graafian follicles; it was made up principally of connective tissue.

The case described by Heppner was that of a two-months-old child. The external genitals were of the masculine type. The penis was imperforate. Internally there was an infantile uterus with tubes and ovaries on either side. On each side, also,

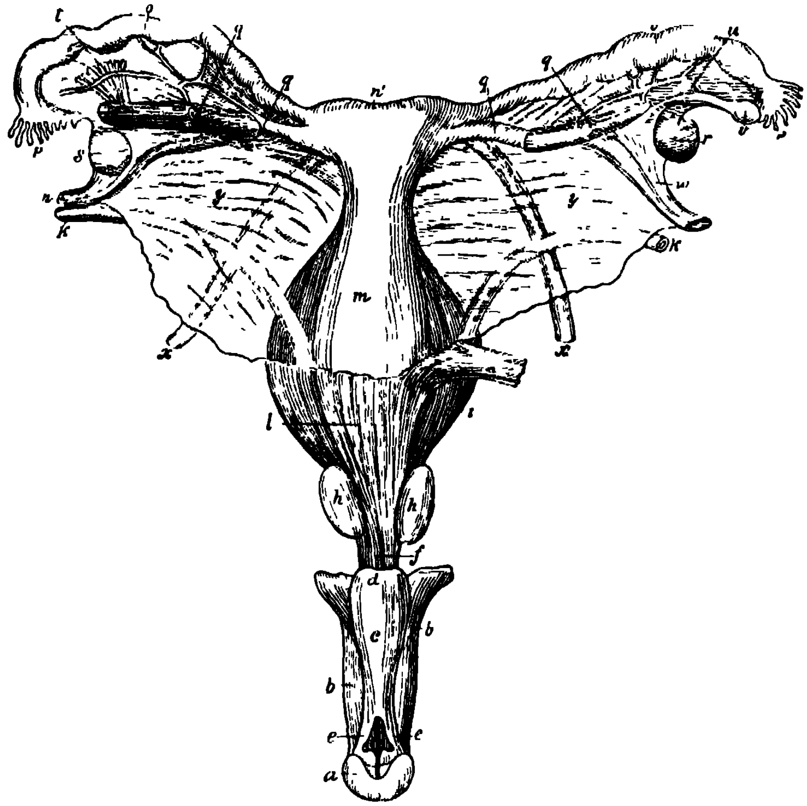

Fig 97 —Hermaphroditismus bilateralis. *a*, Glans penis, *b*, corpus cavernosum penis, *c*, corpus cavernosum of urogenital canal; *d*, its bulb; *e*, its anterior arm, *f*, membranous portion of urogenital canal; *h*, prostate, *i*, bladder; *k*, ureters; *l*, vagina; *m*, uterus, *n'*, fundus uteri; *o*, *o*, tubes, *p*, *p*, their infundibula, *q*, *q*, ovaries, *q'*, *q'*, their ligaments; *r*, right testicle; *s*, left testicle, *t*, left parovarium, *u*, right parovarium, *v*, hydatid of Morgagni; *w*, *w*, blood-vessels; *x*, *x*, round ligaments, *y*, *y*, broad ligaments, *, muscle-fibers from bladder and vagina.

there was a testicle, separated from the ovary by the parovarium While the microscopical examination demonstrated the nature of the ovaries, it could not be demonstrated clearly under the microscope that the neighboring glands were testicles. There may, however, be imperfectly developed glands of both sexes in one individual[1]

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[1] "Ein Fall von Hermaphroditismus," G Schmorl, "Virchow's Archiv," Bd. cxiii, p 229.

Friedrich W., aged twenty-one years, art student from Berlin, sought admission to the surgical clinic in Leipsic for a congenital defect of the sexual organs, which proved to be hypospadias. He was operated upon and died. The postmortem examination resulted as follows: Face bearded, hairs about two centimeters long Breasts undeveloped. Mons veneris had a hairy growth like a female, ending abruptly above. The penis, freed from its adhesions by the operation, measured about 5 5 centimeters in length on the upper surface and had a circumference of 8 centimeters The glans was 1 25 centimeters long. At the sides of the penis were genital folds projecting above and grasping the penis between them. Internally there was discovered an opening into the urethra 3 5 centimeters back of the external orifice, into which a sound could be passed for 15 centimeters. Further dissection discovered this canal to be a vagina and a uterus, the latter separated into cervix and corpus. On the left side the tube ran into the inguinal canal and was continuous with a body removed from the groin at the operation, thought at the time to be a testicle, but which was found to be mainly the distended and distorted fimbriated extremity of a Fallopian tube Microscopical examination of this body showed in it the remains of a sexual gland having all the histological characteristics of a fetal ovary without ovules. On the right side there were a round ligament, tube, and ligament analogous to that of the ovary, all running down to the sexual gland in the right scrotal sac, which the microscope showed to be a testicle. There were no spermatozoa, nor was there a vas deferens. It really seems that this might be called an example of true lateral hermaphroditism

Pseudohermaphroditism.—Klebs classifies pseudohermaphrodites in the following manner:

Pseudohermaphrodites with double sexual formation of the external genitals, but with unisexual development of the reproductive glands (ovaries, testicles).

I. Male pseudohermaphrodites (with testicles)

1. Internal pseudohermaphrodites Development of uterus masculinus.

2. External pseudohermaphrodites. External genitals approach female type; feminine appearance and build

3 Complete pseudohermaphrodites (internal and external) Uterus masculinus with tubes. Separate efferent canals for bladder and uterus.

II. Female pseudohermaphrodites (with ovaries) Persistence of male sexual parts.

1. Internal hermaphrodites. Formation of vas deferens and tubes.

2. External hermaphrodites. Approach of external genitals to male type.

3. Complete hermaphrodites (external and internal). Masculine formation of the external genitals and of a part of the sexual tract.

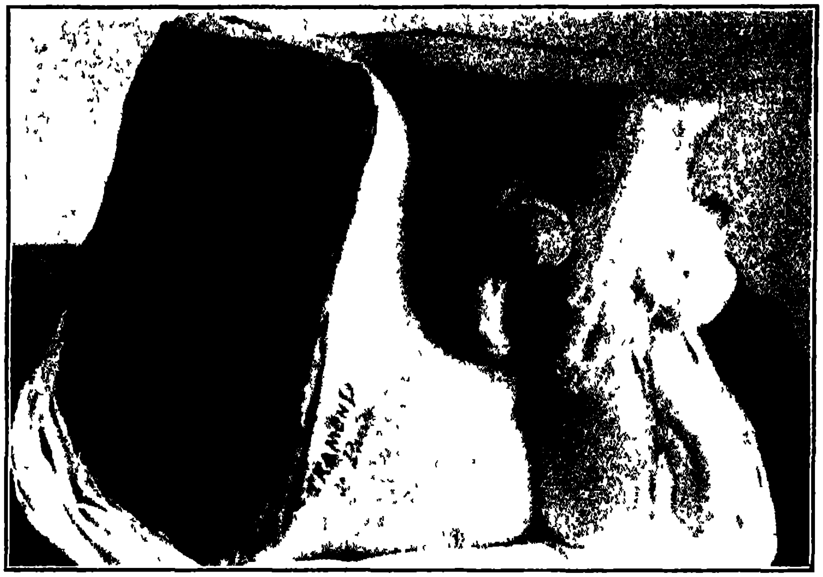

Fig. 98.—Masculine pseudohermaphroditism (wax model, Hodge collection. University of Pennsylvania)

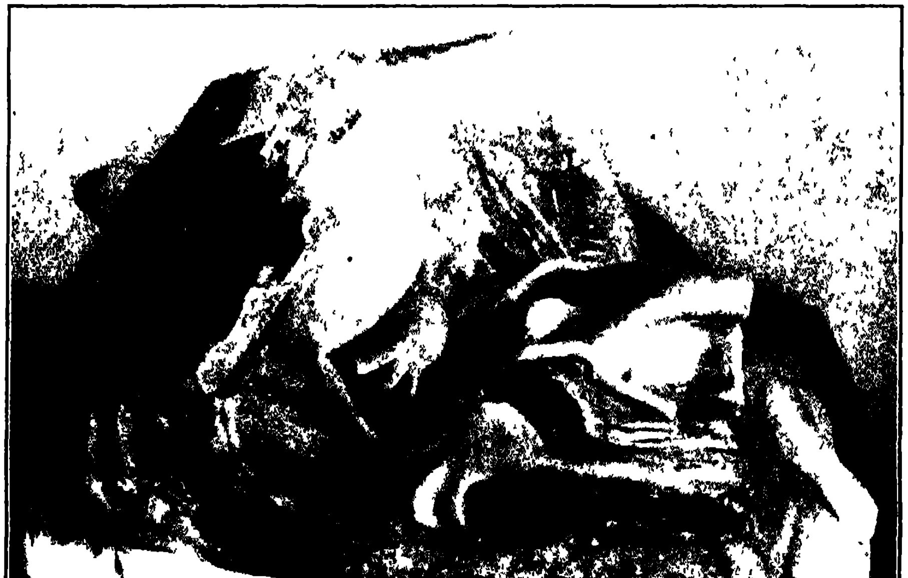

Fig. 99.—Same as figure 98, in profile, showing uterus.

As may be seen in the classification, pseudohermaphrodites have the glands of one sex, but other sexual parts either intermediate or mixed. They are in the vast majority of cases of the masculine sex, although this may be difficult to determine during life. Numerous instances are recorded of mistakes as to sex which continued throughout a great part or the whole of life.

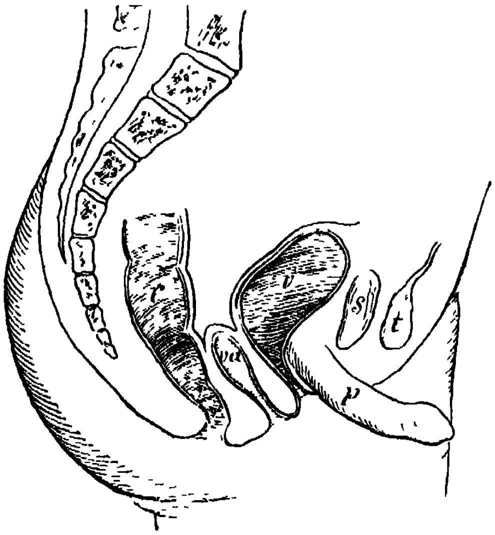

Fig 100.—Masculine pseudohermaphroditism: *va*, Vagina; *v*, bladder, *r*, rectum, *p*, penis, *s*, symphysis, *t*, testicle.

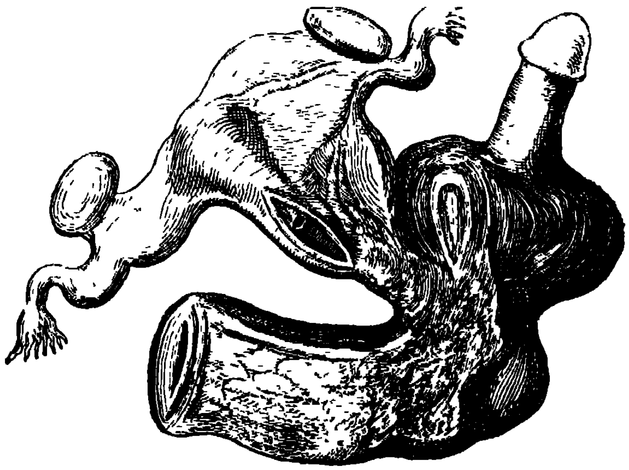

Fig 101.—Masculine pseudohermaphroditism with vagina, uterus masculinus, and tubes. The vagina empties into the urethra

The author has seen an individual don his first trousers at the age of nineteen. He had been brought up as a girl, until his beard began to grow and he began to manifest sexual inclinations toward his female companions.

A masculine pseudohermaphrodite has in a number of instances married as a woman, and learned his true sex only on consulting a physician for sterility. It is safer, in cases of doubt, to regard the sex as masculine and to clothe and educate the individual as a male.[1]

There are many degrees of masculine pseudohermaphroditism, from a simple enlargement of the vesicula prostatica, without abnormality of the external genitals, to the full development of a uterus masculinus, divided into corporeal and cervical

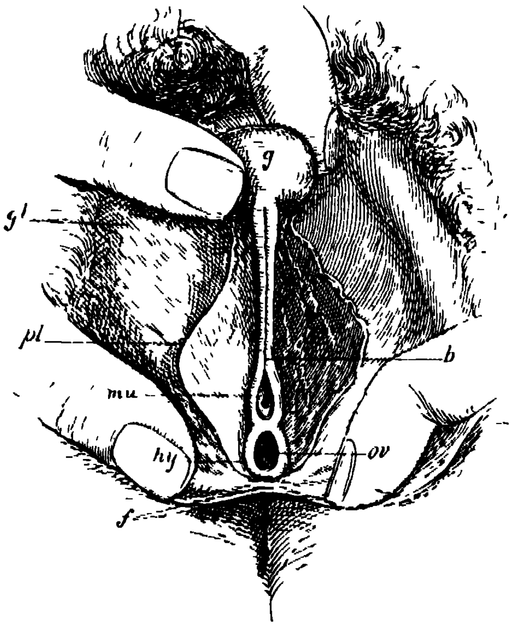

Fig 102. — Pseudohermaphroditism proper External organs of Louise B—— (man) *g*, Glans, *b*, frenum, *ov*, vulvar orifice, *hy*, hymen; *f*, fourchet, *pl*, nymphæ, *gl*, labia majora, *mu*, meatus urinarius

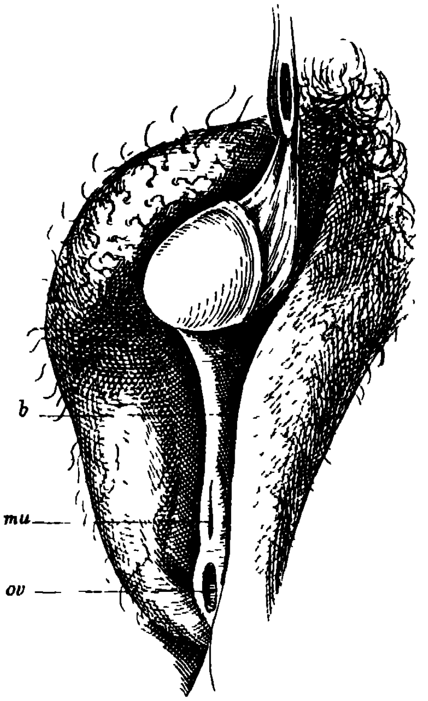

Fig 103 - Pseudohermaphroditism proper External genit of Julia D- appearance of the parts with the penis raised and the thighs separated , Frenum, *mu*, meatus, ifice

portions, with perfect tubes and a vagina opening externally into a urogenital cleft[2] In the latter case the penis is rudimentary and there is hypospadias, the urethra opens by a separate canal at the urogenital cleft, there is a rudimentary development of the scrotal halves, and the testicles may be in the abdominal cavity

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[1] A male pseudohermaphrodite, with a penis, scrotum, and testicles, but with a vagina and uterus, having a feminine type of body, told the author that he was unhappy in his dress and occupation as a male He thought it would have been wiser had he been educated and clothed as a female.

[2] Engelhardt reports a case of carcinoma of the uterus in a male pseudohermaphrodite. "Monatsschr f Geburtsh u. Gyn.," Bd xii, H 6

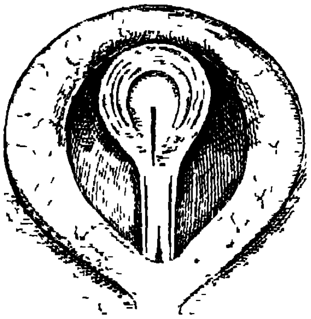


Fig 104 —Partial pseudohermaphroditism, with hypertrophy of clitoris (Pozzi)

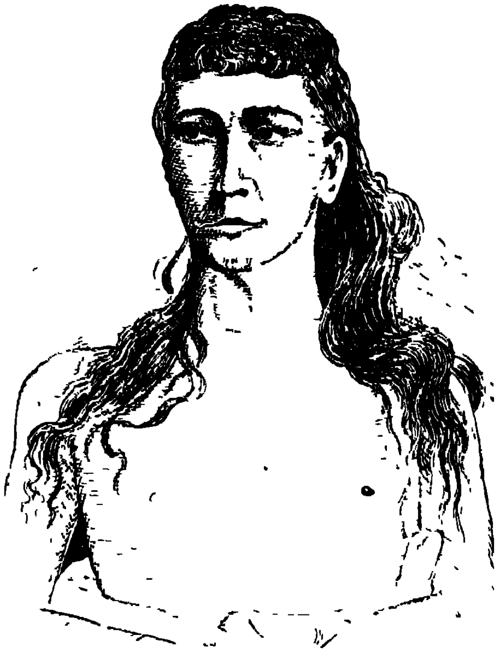


Fig 105 —Masculine pseudohermaphroditism (Bonnet and Petit)

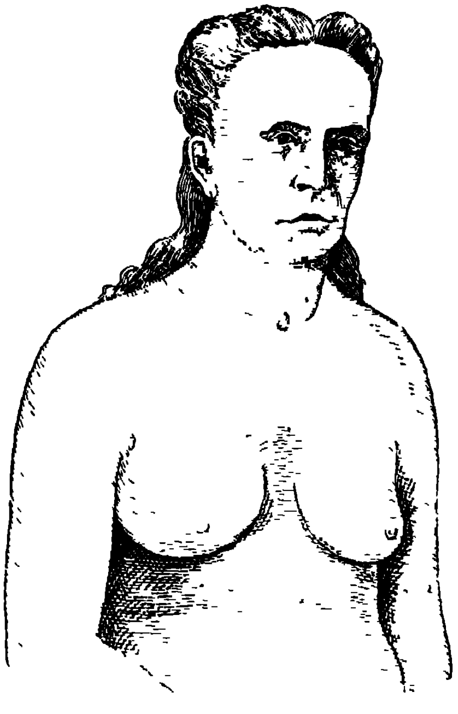


Fig 106

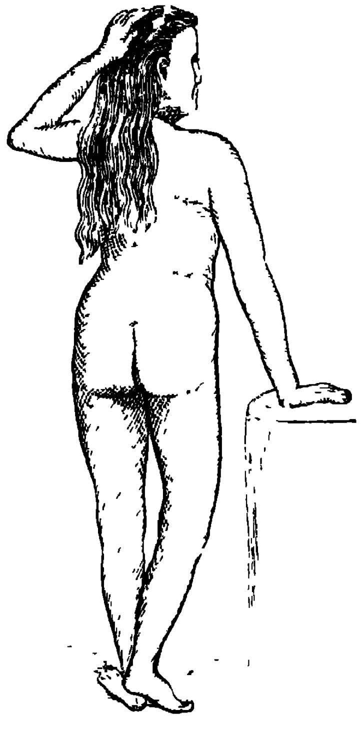


Fig 107

Figs 106 and 107 —Carl Lohmann, masculine pseudohermaphrodite, who lived for forty-six years as a female He then assumed male attire and married as a man.

The vasa deferentia empty usually in the urethra, sometimes in the urogenital cleft, and rarely in the cavity of the vesicula. The character of the body closely approaches the female type in well-marked cases of masculine pseudohermaphroditism. The hair on the head grows long, the beard is very scanty or fails to appear, the breasts are large and sometimes contain secretion, the waist is small, and the hips are broad. A regular monthly discharge of blood and mucus from the genitalia or the urethra has been noted in several instances. It is not strange that such creatures should be regarded as females, for the only true mark of their sex may not be discoverable till after death. The best proofs of sex during life are afforded by the presence of spermatic particles in the discharge accompanying sexual excitement in the male and by impregnation in the female. In intermediate grades the external genitals may not be much affected, and the uterus masculinus and vagina may open into the urethral canal of a fairly well formed penis. The scrotum may show various grades of development: one half may be pretty well formed and contain a testicle, while the other is rudimentary and empty. The testicle in such a case may be detected in the inguinal canal or may be altogether in the abdomen. However doubtful might be the sex of a masculine pseudohermaphrodite during life, an examination of the pelvic cavity after death should settle the matter definitely, and yet mistakes have been made in the description of postmortem specimens.

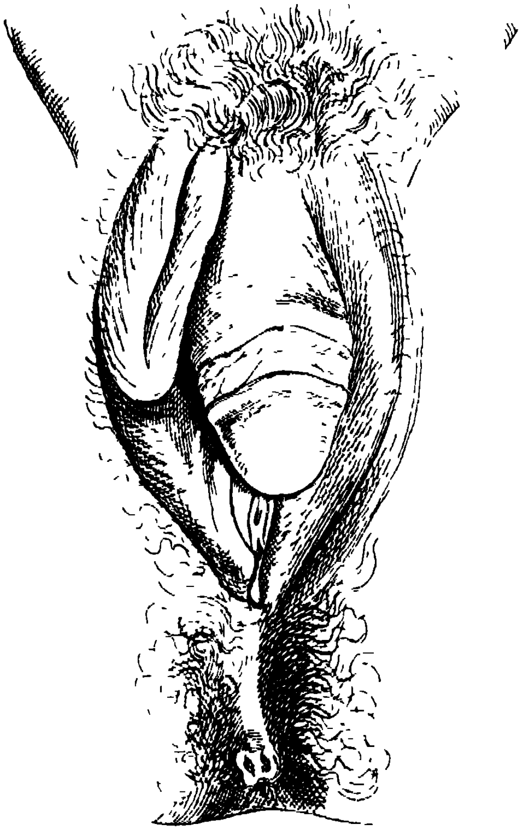


Fig. 108.—Feminine pseudohermaphroditism. The right labium contained an ovary (Fehling).

Feminine pseudohermaphroditism is rare, and reported cases should always be regarded with a suspicion that the individual is really a man. A hypertrophied clitoris, perhaps a rudimentary vagina, ovaries prolapsed into the labia, the formation of the scrotum, and the existence of vasa deferentia are the characteristics of this class.

The following remarkable case was reported to the "New York Medical Journal," November 22, 1890, by Dr. C. W. Fitch, at one time in charge of the sanitary service of Salvador, Central America:

" J. H. A., a house servant, of masculine features and movements; aged twenty-eight years; height, five feet seven inches; weight, one hundred and thirty-nine pounds, was arrested by the police for violating the law governing prostitution. On examination, both female and male organs of generation were found in a remarkably well developed condition. The labia majora were of normal size, but flattened on their anterior surface The labia minora and hymen were absent The vagina was capacious, four and one-half inches long anteriorly and six inches posteriorly. The os uteri was torn on the left side. There was profuse leukorrhea. Seven years before she had given birth to a normal female infant. In place of the clitoris there was a penis, which, when in erection, measured five inches and a quarter long by three and five-eighths inches in circumference. The glans

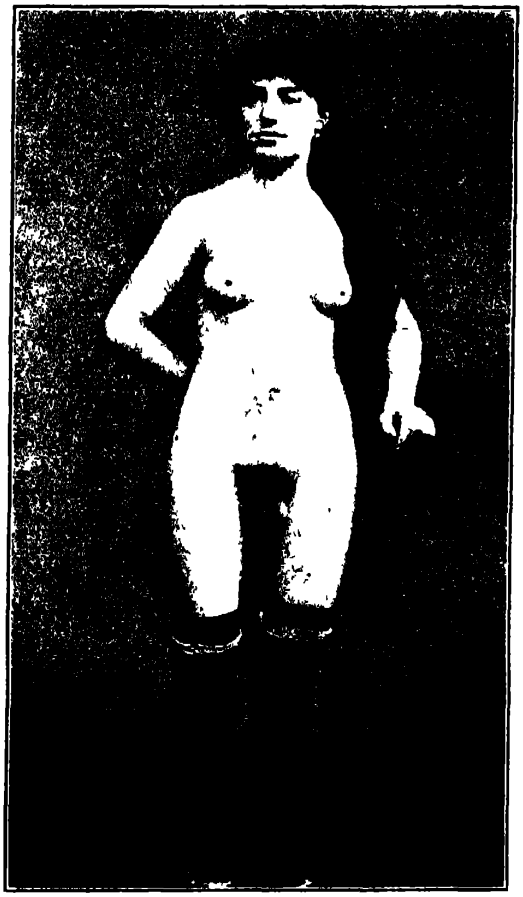


Fig. 109 —Feminine pseudohermaphroditism

penis and the urethra were perfectly formed. The scrotum, which was two and one-eighth inches long, contained two testicles (?) about an inch in length and two inches and a half in circumference. The mons veneris was sparsely covered with short, straight, black hair. Both sets of organs were perfect in their functions, semen being ejected from the penis (?), and the ovaries being capable of producing eggs. Scanty menstruation occurred every three weeks and lasted but two days. Sexual gratification was said to be equally distributed between the two sets of organs." Stripped of inaccuracies, this is doubtless a description of a remarkable example of pseudohermaphroditismus femininus.

It seems to be a well-established fact that the external appearance of a masculine pseudohermaphrodite corresponds with the type of the external genitals. The more closely they approach the female form, the more feminine is his appearance. This is well illustrated in the case of Carl Lohmann, and, negatively, in the case reported by Bonnet and Petit, of a man with pseudoscrotal hypospadias, who was educated and clothed as a girl, but who had nothing feminine in his appearance except long hair and his dresses. He was in the habit of copulating with his female companions, and acquired in time a chancre. In female hermaphrodites this rule does not always hold good; the feminine appearance may be retained in spite of a close approximation of the external genitalia to the male type. The individual represented in figure 109 claimed to be, and was regarded as, a woman, but may possibly have been a male pseudohermaphrodite.

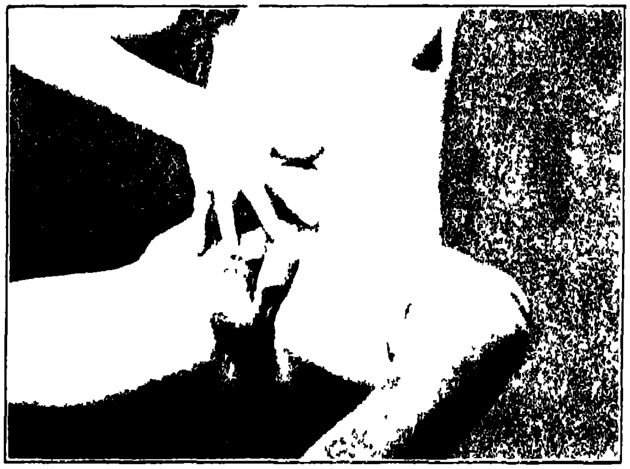


Fig. 110 — Feminine pseudohermaphroditism. Same case as figure 109.

PART III.

DISEASES AND INJURIES OF THE VULVA; COCCYGODYNIA.

The vulva is a generic name applied to the labia majora, labia minora, clitoris, vestibule, fourchet, and fossa navicularis The vulvovaginal glands, the bulbs of the vestibule, the external urinary meatus, and the urethral glands are structures belonging anatomically to the vulva.

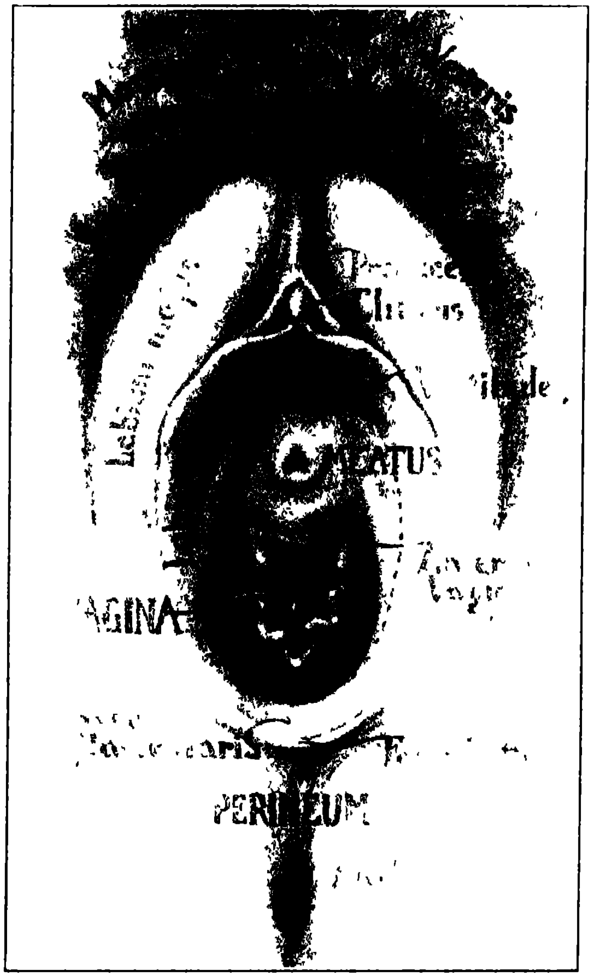


Fig 111.—Diagram of the genitalia (Dickinson)

The mons veneris is a flat protuberance over the symphysis pubis, consisting of fat and connective tissue covered by a tough skin clothed with coarse hair. In females the upper border of the hairy region is a horizontal line; in males the hair rises in a triangular shape to a point upon the median line of the abdominal wall.

The labia majora are folds of skin containing fat, connective tissue, and involuntary muscle-fibers, continuous with the mons veneris and uniting below an inch in front of the anus. They surround the urogenital fissure Their points of junction above and below are called the anterior and posterior commissures.

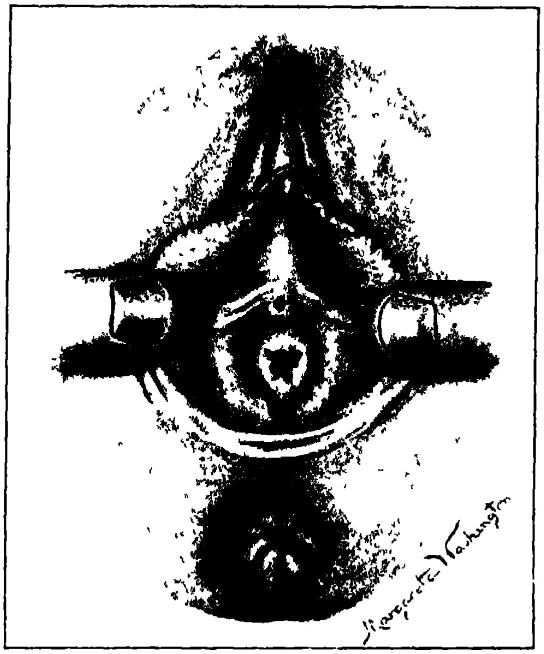


Fig. 112 —Normal vulva in a virgin.

Just within the latter there is a crescentic transverse fold of skin, called the fourchet Between the fourchet and the base of the hymen is the fossa navicularis.

The Labia Minora, or Nymphæ.—Just below the anterior commissure of the labia majora the nymphæ begin on each side as two leaflets of delicate skin; one, the upper, with its fellow of the other side, constituting the prepuce of the clitoris, the lower leaflet, with its other half, forming the frenum of the prepuce. These two leaflets on each side unite below and to the outer side of the clitoris, to form the labium minus, which runs downward to merge into the labium majus at about its middle or lower third The labia minora are often asymmetrical. They lie apposed to each other in the middle line, completely covered by the labia majora They vary much in size. The covering of the nymphæ is in a transition stage between mucous membrane and skin. It merges on its outer side into the delicate skin of the inner surface of the labia majora, and on its inner side into the mucous membrane of the vestibule. The venous spaces and the unstriped muscular fibers in the nymphæ resemble the structure of erectile tissue.

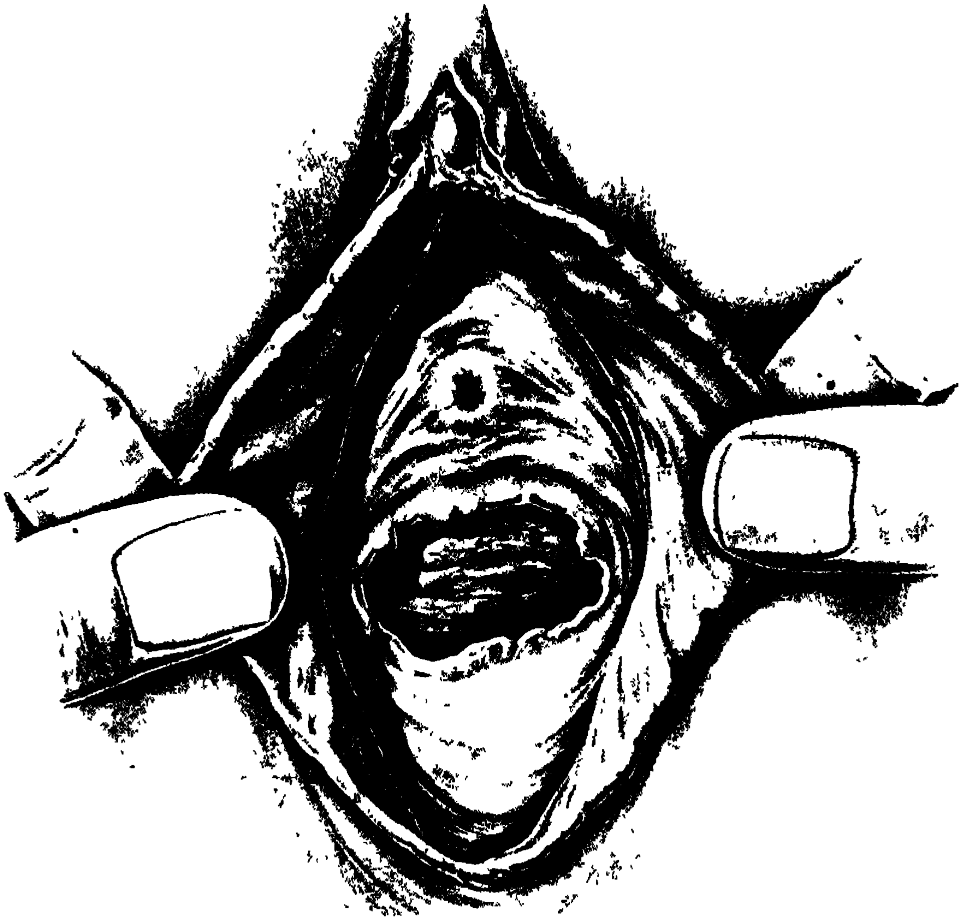


Fig 113 —Normal vulva (Deaver)

The vestibule is the space between the clitoris, nymphæ, and vaginal entrance. It is pierced in its mid-line by the urethral orifice—the external meatus. The bulbs of the vestibule are two masses of venous plexuses about an inch long, lying along the sides of the vestibule below the clitoris and within the nymphæ. They are the homologues of the corpora spongiosa in the male. In sexual excitement, by muscular compression of their efferent vessels, they become turgid and erect

The clitoris has the structure and anatomical features of the penis, but in miniature, and modified by the cleft below, the absence of the urethra, and the separation of the spongy bodies into the bulbs of the vestibule The cavernous bodies of the clitoris are erectile. The glans of the clitoris is surrounded at its base by sebaceous follicles secreting a smegma, which, if confined by preputial adhesions, may cause irritation by its decomposition.

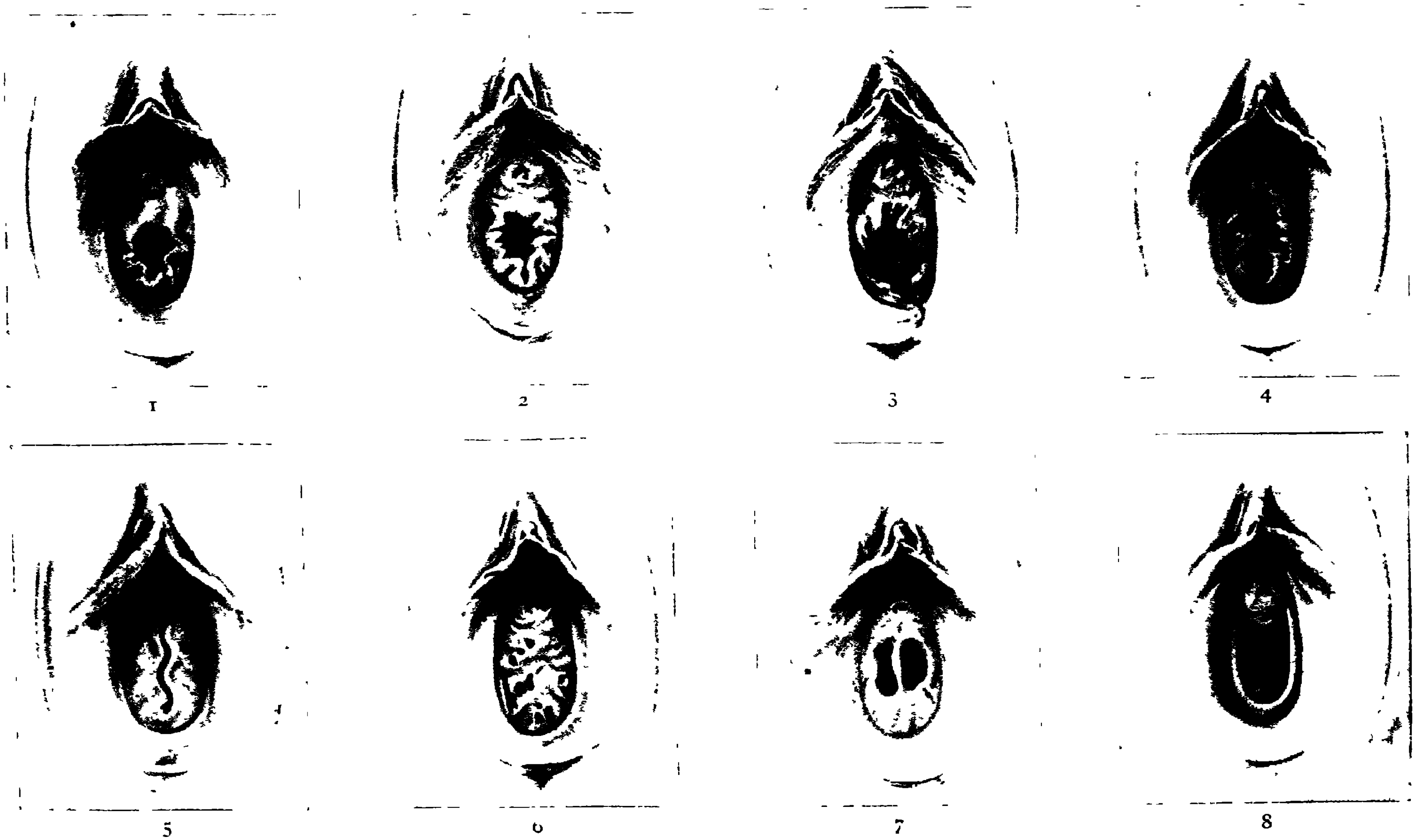
Bartholin's glands, or the **vulvovaginal glands,** are mucoserous, racemose glands about a third of an inch in diameter, lying under the mucous membrane of the lateral vaginal walls and emptying by long, slender ducts on the under surfaces of the labia majora just outside the vaginal entrance

The Hymen.—The crescentic septum, occluding usually the posterior portion of the vaginal entrance, with the concavity of its opening directed upward, but presenting often an annular, cribriform, cordiform, crenelated, or cleft appearance, is a fold of mucous membrane reinforced by fibrous tissue, usually ruptured with ease, but occasionally so firm and unelastic that it even resists the impact of the descending head in labor The hymen is torn at the first coitus, sometimes by gynecological examinations, or by masturbation It is partially destroyed in labor, the remnants persisting as isolated protuberances around the vaginal orifice—**the carunculæ myrtiformes.**

The sensory nerve-supply of the vulva is derived from the pudic nerve or its two terminal branches, the dorsal nerve of the clitoris, and the perineal nerves, the inferior pudendal, the genitocrural, and the ilio-inguinal. The perineal branches of the pudic are given off at the outer upper edge of the ischiorectal fossa The nerve of the dorsum of the clitoris, one of the terminal branches of the pudic, lies to the outer side of the pudic artery and runs alongside the inner surface of the ascending ramus of the ischium, under the inferior layer of the triangular ligament. The inferior pudendal nerve crosses the ascending ramus of the ischium an inch above the tuber ischii, running upward and inward to the labium, the genital branch of the genitocrural and the ilio-inguinal descend to the labium from the external inguinal ring.

Vulvitis.—The tissues of the vulva are covered by skin and mucous membrane, these coverings are subject to the same inflammations as in other parts of the body. Eczema, herpes, acne (follicular vulvitis), erysipelas, thrush, diphtheria, streptococcic infection, furuncles, need present no difficulties in diag-

PLATE 1.



Varieties of hymen. 1, Virgin hymen, commonest form (annular); 2, hymen after coitus; 3, after delivery; 4, fimbriate hymen; 5, hymen with narrow slit; 6, cribriform hymen; 7, hymen with septum; 8, horseshoe form.

nosis and require the same treatment as elsewhere. An acute inflammation of the vulva depends in more than three-quarters of the cases upon gonorrheal infection, though it may have its origin in uncleanliness, irritating discharges from the vagina, as in cancer, vesicovaginal fistula, or senile leukorrhea, the decomposition of diabetic urine, seat-worms, the infectious discharges from the bowels in typhoid fever and dysentery, thrush, traumatism, the mechanical irritation of violent, too frequently repeated coitus and masturbation, or ungratified sexual desire if the woman is mated with an impotent man.

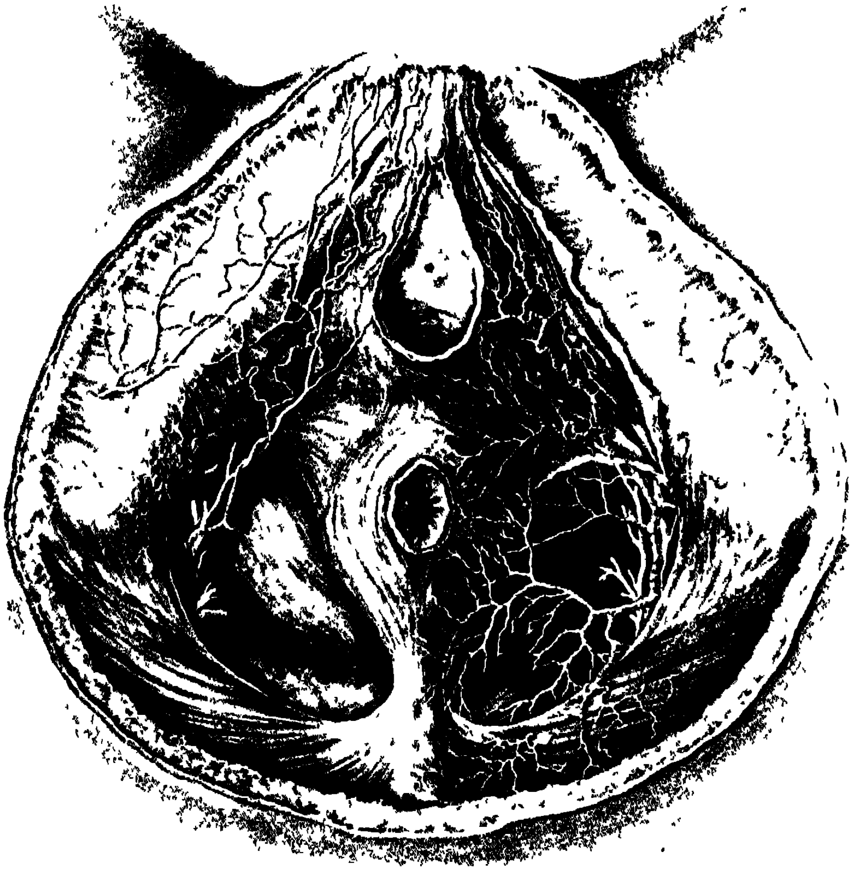


Fig 114 —Dissection of the vulva, showing nerves and blood-vessels On the woman's right are the inferior pudendal and the superficial perineal branch of the pudic, on the left, the inferior layer of the triangular ligament being removed, are shown the two terminal branches of the pudic nerve, on either side of the pudic artery (Deaver).

In *gonorrheal vulvitis* the parts are covered with a profuse mucopurulent discharge, the skin is reddened, the mucous membrane is a deep scarlet in color. The patient suffers pain in walking and complains of burning on micturition. The acute stage rapidly subsides from the surface of the vulva, but the orifice of the urethra remains reddened and angry in appearance, a drop of pus may be squeezed out of it by passing the tip of the forefinger along its course from within outward, and two reddened spots may be seen where the ducts of the vulvovaginal glands open without the hymen and to either side of the vaginal entrance (gonorrheal macules). The mucous membrane of the inner surfaces of the labia minora and of the vestibule may exhibit areas of intense congestion and inflammation persisting for months and years in spite of treatment.

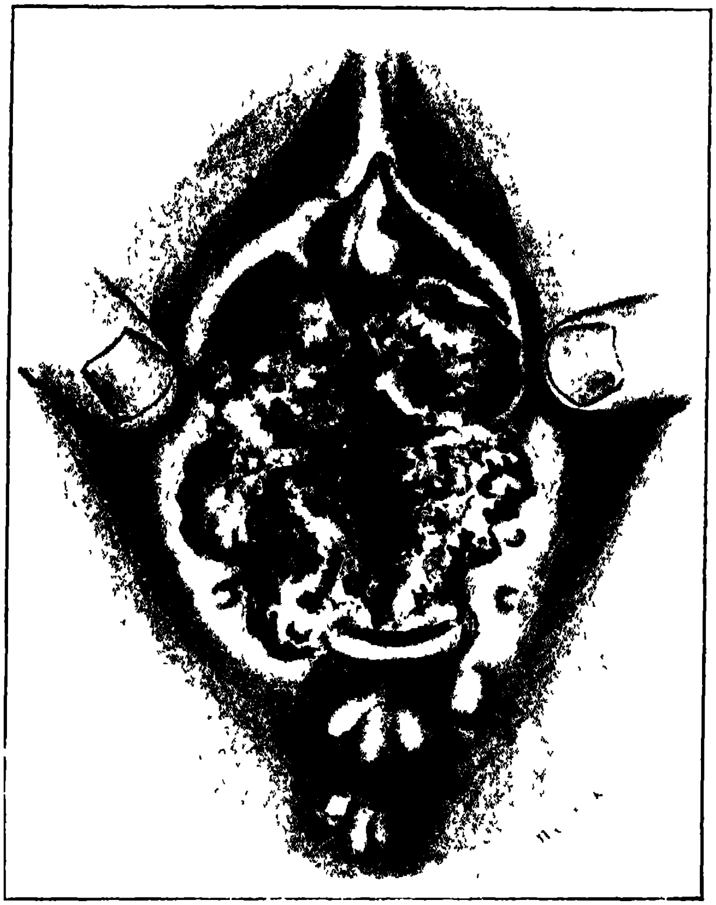
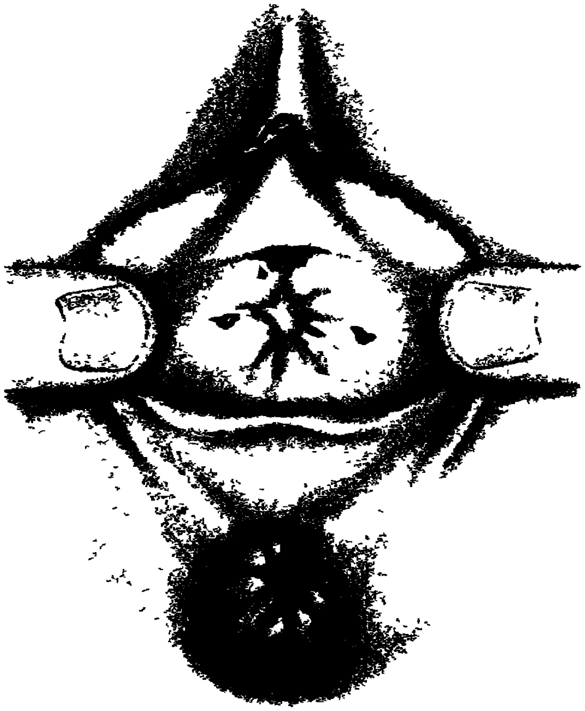


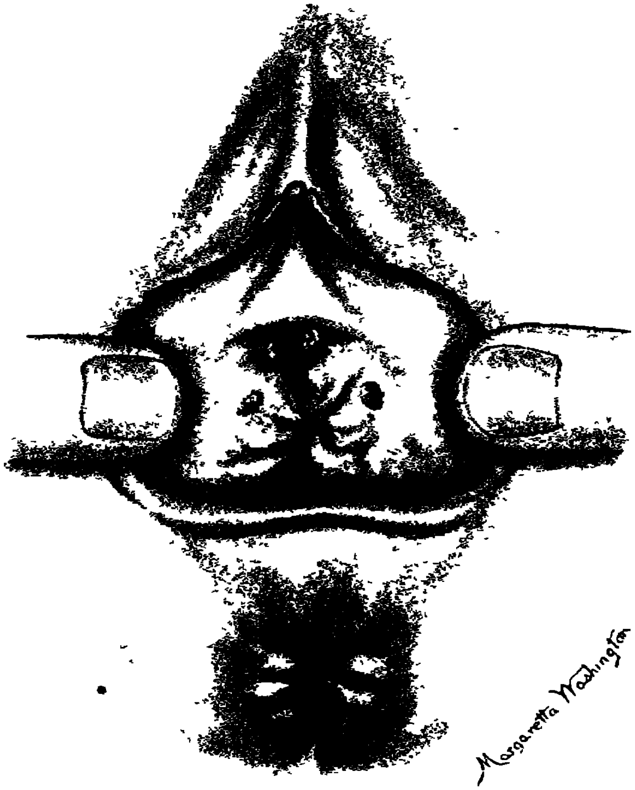
Fig 115.—Streptococcic infection of the vulva.

In vulvitis from irritation and not from infection, the labia minora are hypertrophied, the mucosa is reddened, but has not the angry appearance of gonorrhea, the sebaceous glands of the labia minora are much enlarged, and the papillæ of the vestibular mucous membrane project in an acuminate form that suggests condylomata, but they are never branched and they never extend

PLATE 2.



Chronic gonorrhea with macules at the orifices of the ducts of the vulvovaginal glands, and erosions of the vestibule



Chronic gonorrhea with macules at the orifices of the ducts of the vulvovaginal glands and at the orifices of Skene's ducts, in the external urinary meatus

to the skin surfaces. They are sometimes so extremely sensitive that they are probably neuromatous

Treatment.—In treating vulvitis the cause must always be ascertained and the treatment directed to its removal. A cardinal principle in the treatment, whatever the cause, is a thorough cleansing of the parts twice daily with pledgets of cotton and warm water, to which a small quantity of tincture of green soap is added. In gonorrhea, easily recognizable by the symptoms described or demonstrable as a rule by the presence of the gonococcus, the vagina should be douched twice daily with permanganate solution (saturated solution, fʒj to Oij of water) Tampons in the vagina saturated with argyrol solution, 5 per cent., followed by a lamb's-wool tampon dusted with tannic acid or saturated with boroglycerid, should be inserted after the douche. If possible, the patient should be confined to bed, the diet should be light, large quantities of water should be drunk, and salol or urotropin should be administered internally for their antiseptic action on the urethra. When the acute stage has passed, astringent vaginal douches (zinc sulphate, ʒss, powdered alum, ʒj to Oij of water) and a dusting-powder externally (borated talcum powder) should be used If the pain in the acute stage is severe, hot fomentations of the fluid extract of witch hazel give relief.

In the non-gonorrheal forms of vulvitis or in chronic inflammation which may have had its origin in gonorrhea, astringent and antiseptic applications are called for: Solutions of nitrate of silver, gr. x–ʒj to f℥j of water; Monsel's solution, fʒj to f℥j of glycerin, equal parts glycerin and carbolic acid, formalin solution, as strong as 1 per cent; protargol or argyrol solution, 5 to 50 per cent, glycerole of tannin, iodin and glycerin, or the Churchill tincture may all be tried with more or less success In the worst cases the excision of the mucous membrane around the urinary meatus in the vestibule and on the inner surfaces of the labia minora may be tried, but even then the disease may return and persist for years. A case under the author's observation persisted in spite of every treatment, including excision, and yielded, after some three years, more to the effects of time, apparently, than to the remedies employed

The vulvitis associated with senile leukorrhea is easily cured by inserting in the vagina at bedtime a vaginal suppository containing the milder antiseptics (thyme, eucalyptol, etc.), with glycerin as a base, followed in the morning by a boracic acid douche, ʒj to Oij. A napkin must be worn at night, as the vaginal suppository melts and gives rise itself to a discharge. If the vulva is irritated by diabetic urine, by the constant maceration associated with a vesicovaginal fistula, or by the discharges of cancer, it may be protected by an ointment of boracic acid, ʒj, ung. aq. rosæ, ℥j, or equal parts of subnitrate of bismuth and castor oil. Thrush of the vulva is cured quickly by a boracic acid wash

As a result of gonorrhea, or possibly in consequence of streptococcus or staphylococcus infection, the vulvovaginal glands may be inflamed and may suppurate. A vulvovaginal abscess is usually unilateral The pain is severe, walking is difficult or impossible, and there may be well-marked general symptoms, the patient feeling quite ill. The appearance of an abscess in Bartholin's gland is distinctive One labium is much distended, the vulva is asymmetrical, and if the gland is caught between the forefinger in the vagina and the thumb externally, its enlargement is easily felt and the fluid contents are appreciable Pressure on the gland may result in a drop of pus oozing out of the duct, but often the duct is occluded The most satisfactory treatment of a vulvovaginal abscess is the removal of the whole gland, which can easily be dissected out. If possible to preserve it, the sac-wall should not be ruptured or cut, but as the finger-like process running up the vaginal wall is cut across to free the gland, pus usually escapes. The cavity should be thoroughly cleansed by a sublimate solution, 1 . 1000, and the tissues approximated by interrupted sutures of silkworm-gut, a drain in the

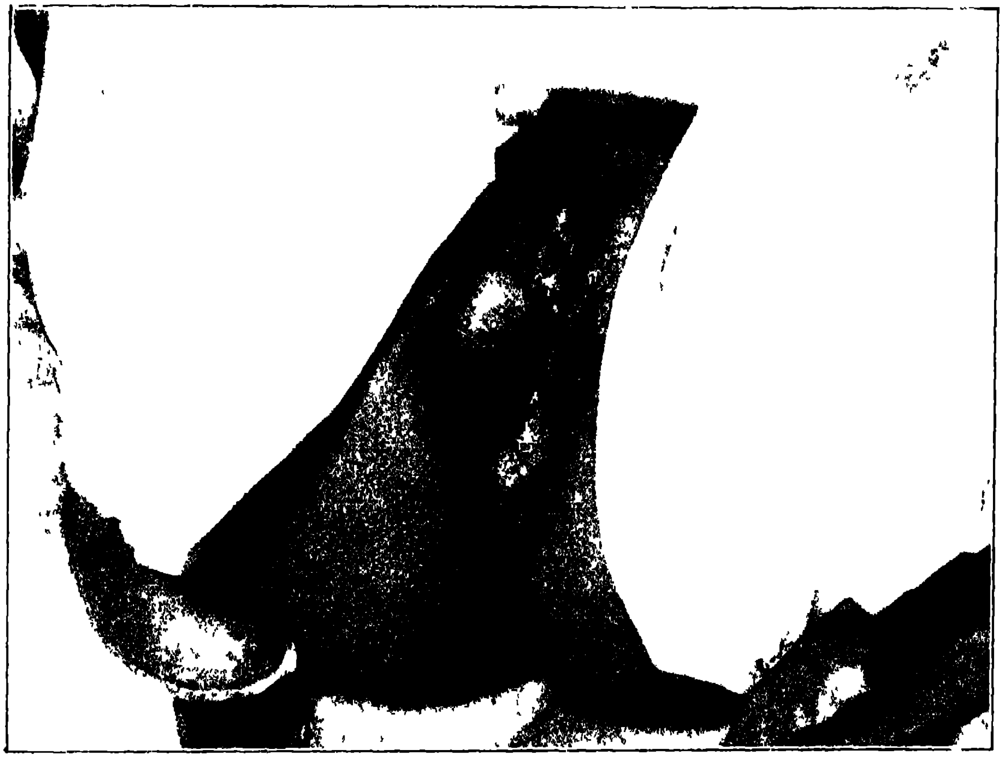


Fig 116 —Abscess of vulvovaginal gland.

shape of a few strands of silkworm-gut being laid the whole length of the wound under the stitches and emerging at both ends. If one is content with a mere opening of the abscess at the junction of skin and mucous membrane on the internal surface of the labium, even if the cavity is curetted, cauterized, and packed, the patient may expect to be annoyed by the recurrence of the abscess over a period of years if she catches cold, has pelvic congestion from any cause, or becomes pregnant. If the gland does not refill with pus or mucus, a persistent fistula at the site of the incision or at the point of spontaneous rupture may discharge a thin mucopurulent fluid for months. In chronic inflammation of the vulvovaginal gland concretions of a chalky character may develop as large as an eighth of an inch in diameter.[1]

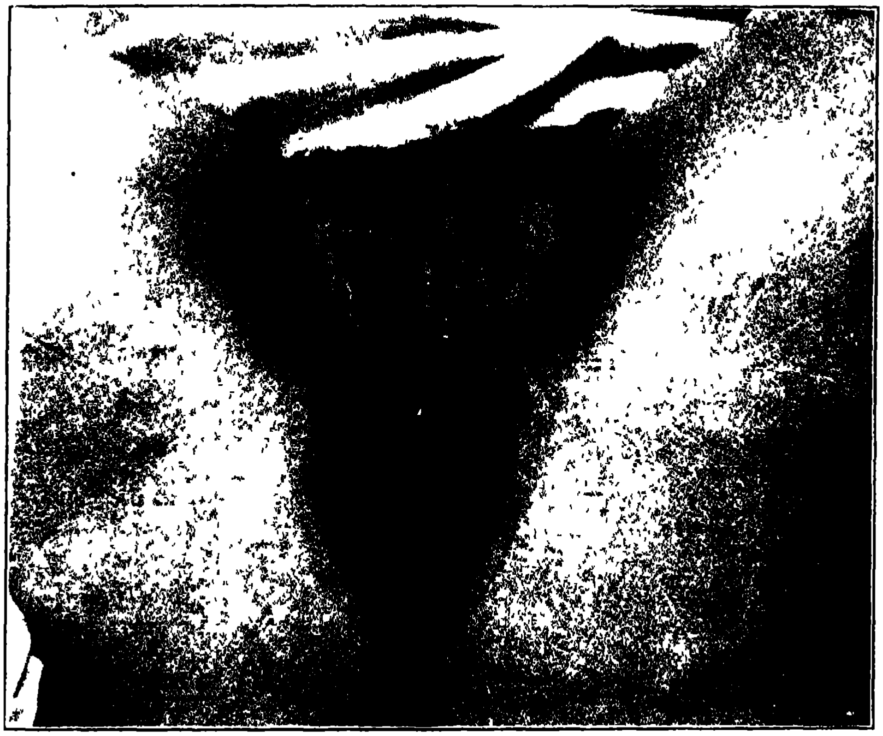


Fig 117.—Pointed condylomata of the vulva.

In chronic infection of the gland, without distention and suppuration, with the orifice of the duct reddened (gonorrheal macule), it may suffice to inject a few drops of pure ichthyol or of a 50 per cent. argyrol solution into the duct with a blunt-pointed hypodermic syringe.

Another disagreeable consequence of gonorrhea is the development, in a small proportion of cases, of *venereal warts* or

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[1] Scott, "Amer. Jour Med. Sci," Oct, 1885.

pointed condylomata on the labia and the perineum. Mere uncleanliness without gonorrheal infection is occasionally responsible for the condylomata, and they sometimes appear in women of the upper classes whose personal hygiene is beyond reproach and in whom it is impossible to demonstrate a specific infection The growths are branched papillomata, perfectly distinctive in appearance. They may occur as isolated spurs or in small patches. Huge warty masses, usually pedunculated, may develop as a consequence of the congestion and nutritive stimulus of pregnancy. There is quite a profuse serous secretion, which keeps the growth partially macerated and irritates the surrounding skin. The most satisfactory treatment is the excision of the growths by an oval incision in the sound skin around their bases. Bleeding vessels must be ligated with catgut and the wound closed with a running or interrupted catgut suture. Single spurs may be destroyed by puncture with the electrocautery point, after cocainization.

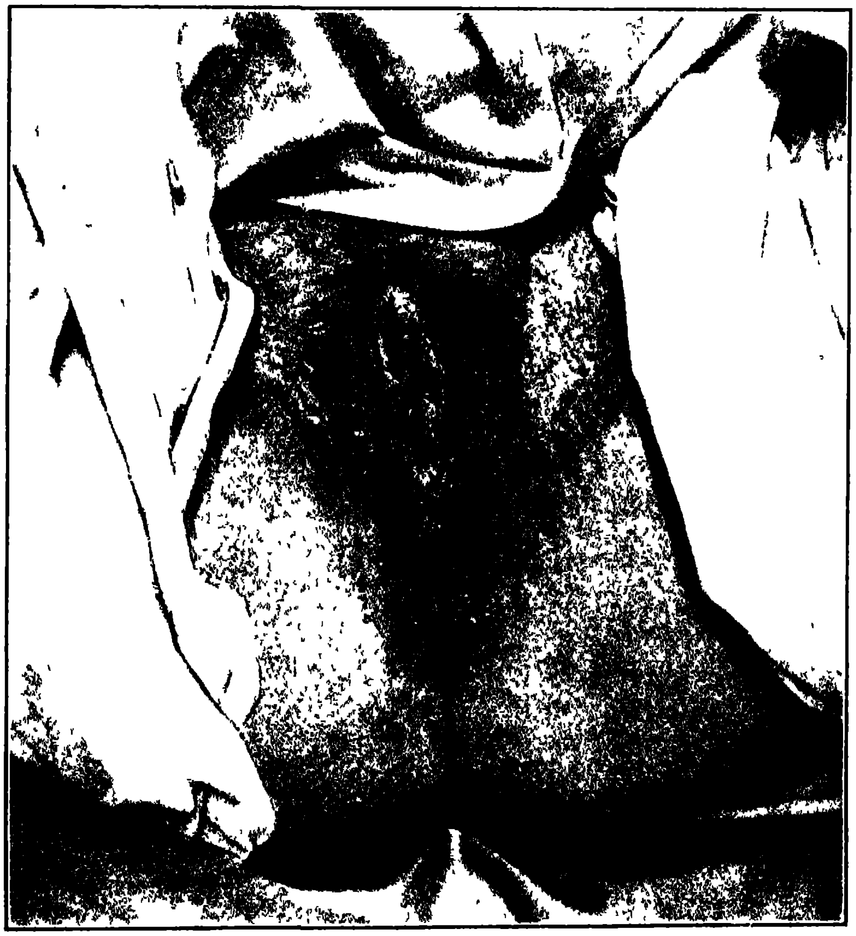

Fig 118 —Single spurs of condyloma on the vulva with a mass around the anus

The labia may be the seat of suppuration (*phlegmon*) from infection following an abscess in Bartholin's gland or an injury. The phlegmon is treated by the ordinary surgical procedures—free incisions, drainage, irrigation, and, if necessary, curetment or excision of the diseased area.

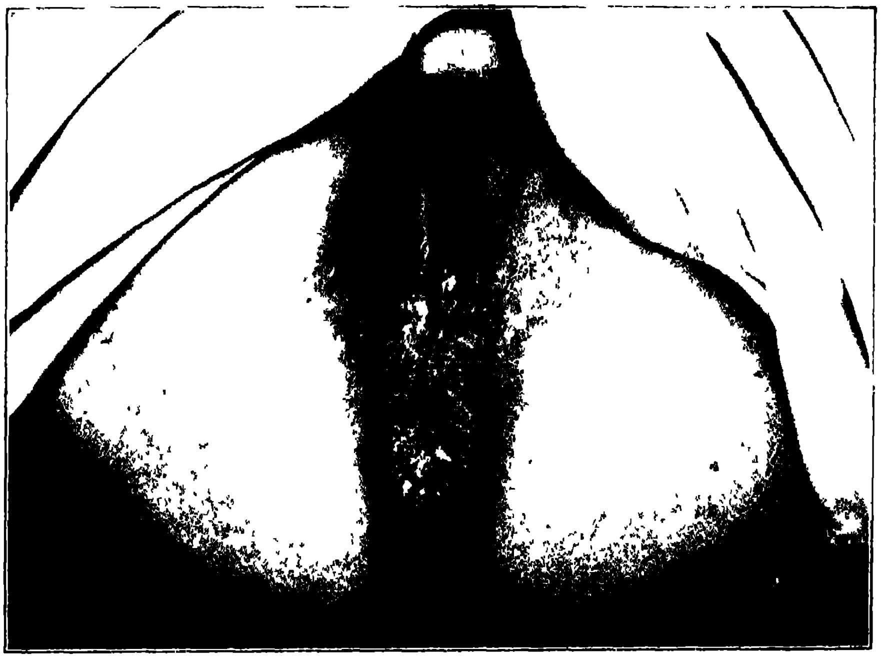

Fig. 119.—Masses of pointed condylomata of the vulva.

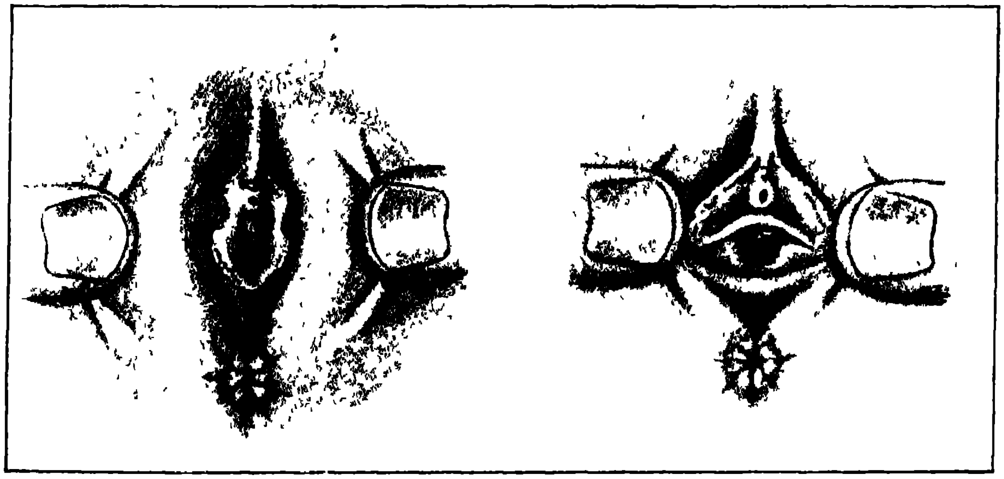

Fig. 120.—Agglutinated labia in infant: 1, Before separation; 2, afterward

Gangrene of the vulva (noma) is rarely seen in young children reduced in strength by an adynamic disease or by very unfavorable hygienic conditions. A whitish vesicle first appears in the labium, which rapidly becomes gangrenous. The treatment consists of stimulation and support, with excision of the diseased area

In infants less than a year old inflammation of the inner surfaces of the labia, often from gonorrhea, possibly from the irritation of rectal discharges, may result in superficial ulceration, the formation of granulation tissue, and the *agglutination of the closely apposed labia.* There is always a sinus left, sometimes anteriorly, sometimes posteriorly, or both If the opening is near the anterior commissure the urine collects behind the agglutinated labia and causes intense irritation, which attracts the attention of the child's caretaker. If the opening is posterior, the urine escapes freely and the agglutination may be overlooked It has persisted to adult life (Rausching, Saenger).

The union of the labia minora or the labia majora is so delicate that they may be separated as a rule by a small blunt instrument, such as a probe or a grooved director The separation may be maintained by pulling the labia apart at the daily bath, by a light gauze pack in the vulvar orifice, or, if necessary, by a few interrupted catgut sutures approximating the skin and mucous membrane over the abraded surfaces.

Pruritus Vulvæ.—Intense itching of the vulva is usually symptomatic. It is due to a local cause of irritation, as pediculi, scabies, ringworm, thrush fungus; to trichiasis (ingrowing hairs) or to a localized dermatitis, as eczema or follicular vulvitis, to irritating discharges from cancer of the cervix, senile vaginitis, myoma of the uterus, chronic endometritis; to excessive sexual indulgence or masturbation, above all, to the decomposition of the urine of diabetes mellitus It may be a reflex symptom dependent upon seat-worms, hemorrhoids, fissure *in ano*, disease of the uterus and its appendages. It may be a localized expression of a gouty or rheumatic diathesis, or of an intestinal toxemia due to shell fish, alcohol, or other food stuffs to which there is an individual idiosyncrasy. The prolonged use of certain drugs, is quinin, has been a cause.

In rare instances the pruritus may be idiopathic. It is a neurosis After a time changes occur in the affected area due apparently to constant scratching There is a thickening of the corium by connective-tissue hyperplasia, the skin is thickened, leather-like in consistency, and unnaturally white in color, with excoriations here and there caused by the patient's finger-nails It was this condition which suggested to Saenger the name vulvitis pruriginosa Webster[1] found on microscopical study a steadily progressing fibrosis of the nerves and nerve-endings of

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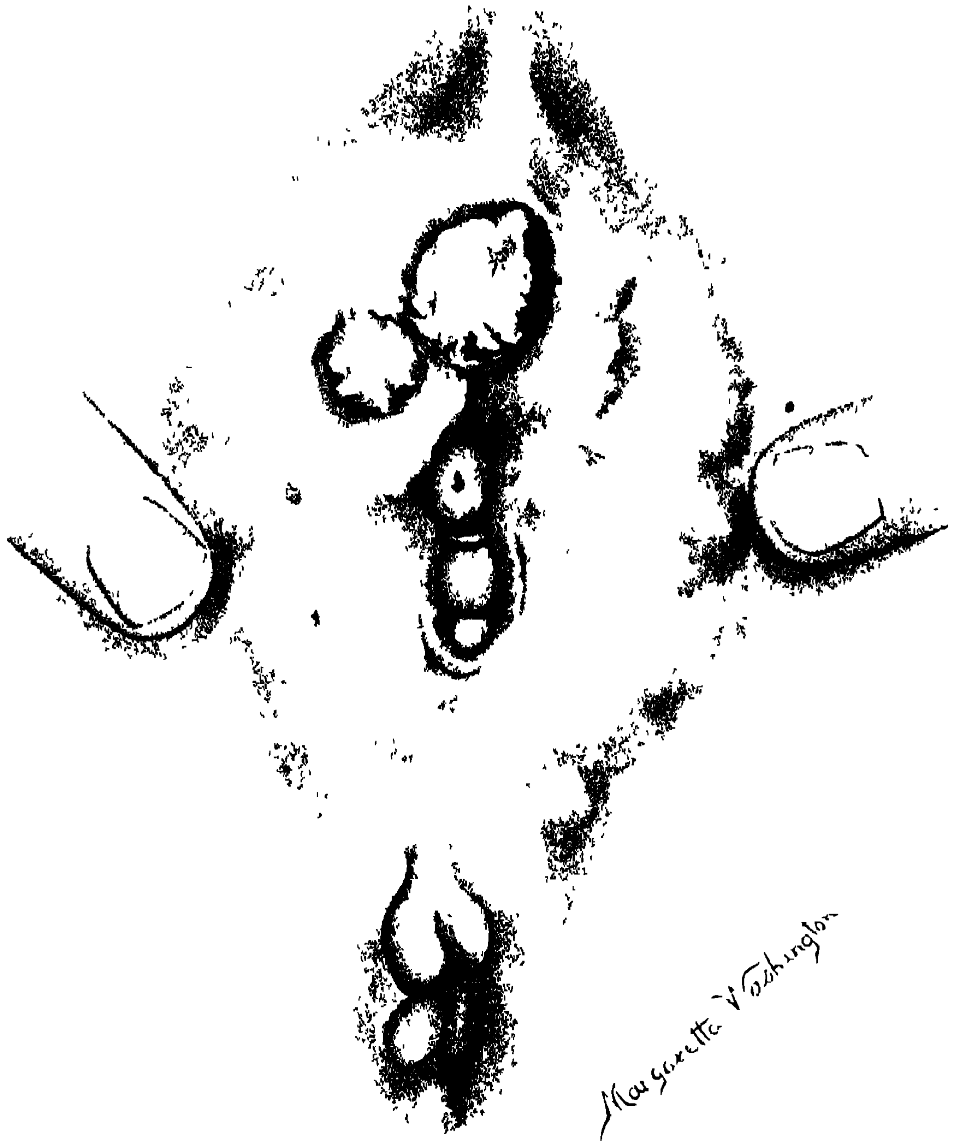
[1] J. C Webster, "Edinb Med Jour," July, 1891.

PLATE 3.



Pruritus vulvæ of twenty years duration, kraurosis vulvæ, epithelioma of the clitoris

the nymphæ and clitoris, but Schroeder and others have failed to find any anatomical alteration in the skin removed. The region affected is chiefly the inner surfaces of the labia majora, the labia minora, and the clitoris; occasionally the itching extends to the mons veneris, the anus, and the inner surfaces of the thighs. In one case under the author's observation the trophic changes in the skin consequent upon a long-continued idiopathic pruritus stopped suddenly half-way down the nymphæ, a sharply defined serpiginous line dividing the healthy and the diseased surfaces. Idiopathic pruritus is a disease usually of middle and advanced age. The itching is worse at night and is increased by warmth or exercise. The congestion of the menstrual periods and of pregnancy increases it. The patient, driven almost distracted, scratches herself savagely, excoriating the tissues. She is unable to sleep. She is unfitted for society, becomes melancholic, and perhaps insane. The irritation of the genitalia excites the sexual appetite, which is gratified by masturbation or excessive coitus. The disease often comes under medical observation after it has lasted for years and is inveterate in its resistance to treatment.

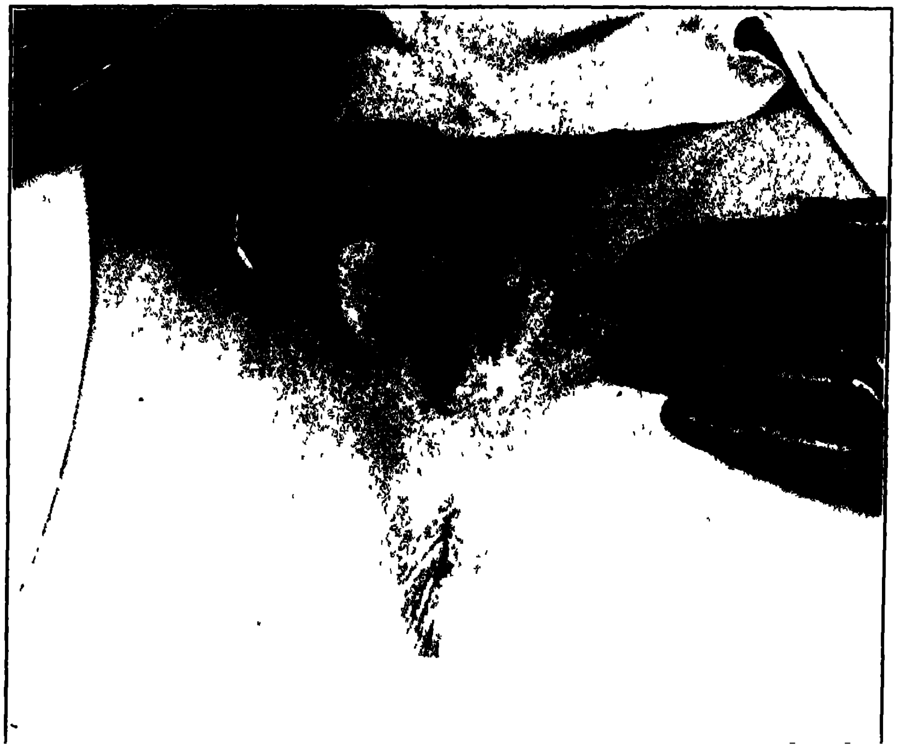


Fig. 121.—Pruritus vulvæ, showing hypertrophied nymphæ and clitoris and leukoplakia.

Treatment.—Pruritus vulvæ should be regarded as symptomatic until it is proved to be otherwise. Before treating it, therefore, a careful search for the cause should be instituted. First and foremost the urine must be examined for sugar. Then a careful investigation must be made of the external and of the internal genitalia, of the digestive organs, the diet, and the systemic condition in general.

For the pruritus of diabetes, dietetic management, local cleanliness, and the protection of the vulva by borated talcum powder, or a boracic acid ointment, are indicated. Mercurial and sulphur ointments are required for pediculi, scabies, and ringworm, boracic acid washes for thrush. The ingrowing hairs of trichiasis must be extracted. Gout and rheumatism, diseases of the vagina, uterus, tubes and ovaries, fistula and fissure *in ano*, and hemorrhoids require appropriate treatment Seat-worms indicate enemata of infusion of quassia. Errors in diet should be avoided, and the prolonged use of a drug forbidden. The sexual hygiene may need supervision For idiopathic pruritus the following local applications have been recommended: Cocain in a 1 to 10 per cent. solution; carbolic acid in solutions of varying strength; nitrate of silver solution; menthol in stick or in an ointment combined with acetate of lead, chloral and camphor; corrosive sublimate in strong solutions (gr. j in f℥j of emulsion of bitter almonds, or alcohol and water, āā f℥ss); ethereal solution of iodoform sprayed into the folds of the vulva; tincture of opium, iodin, and aconite, āā fʒv; lead-water and laudanum; chloroform, fʒj, and glycerin, f℥j; dilute hydrocyanic acid, gtt. ij, water, f℥j; infusion of tobacco; vinegar; vaginal suppositories of ichthyol, 1 part, glycerin, 2 parts; very hot water or an ice-bag, subcutaneous injections of normal salt solution,[1] to 1/3 of a liter, exposure to the *x*-ray and electricity in the form of faradism, rapidly interrupted galvanism, or the high-frequency static current. A patient under the author's observation, treated in vain for many years by a number of specialists, and to whom he had recommended the excision of the labia, cured herself by using carbolic acid mixed with milk in strong solutions. Internal as well as local treatment may be necessary. Cannabis indica and the bromids are the two drugs most to be depended upon.

If the disease resists other treatment it may be cured by the excision of the affected structures, usually the nymphæ and clitoris, possibly the inner surfaces of the labia majora This operation was first proposed and performed by Schroeder. The wound is an inverted V in shape The raw surfaces are easily covered by healthy skin and mucous membrane, which are brought together by interrupted sutures.

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[1] Siebourg, "Centralbl. f. Gyn.," No. 26, 1901.

Another and a better surgical treatment is the resection of the nerves supplying the skin of the vulva. Sir James Y. Simpson cites Dr. Burns, of Glasgow, as the first to recognize "hyperesthesia and neuralgia of the vulva" and to cut the pudic nerve for it, which he attempted by an incision that came nowhere near the nerve. Simpson's subcutaneous section of the nerve was even less likely to injure it From time to time this proposition has been renewed, but has usually been founded on insufficient anatomical knowledge, to say the least. The author has cured three inveterate cases by the resection of the genital branch of the genitocrural, the ilio-inguinal, the perineal branches of the pudic, the nerve of the dorsum of the clitoris, and the inferior or long pudendal nerve on both sides. Four incisions are required: two over the external inguinal rings through the deep fascia; two along the inner edges of the ascending rami of the ischia, from the tuberosity to a point two inches above it. The nerves are not only cut, but as long a peripheral end as possible is pulled out. If the clitoris is involved in the pruritus, it is necessary to resect its dorsal nerve, which requires a deep dissection of the ischiorectal fossa, through the inferior layer of the triangular ligament. The nerve is found to the inner side of the ascending ramus of the ischium on the outer side of the pudic artery. The perineal branch of the pudic is on the inner side of the artery.

Kraurosis vulvæ was first described and named by Breisky[1] in 1885, who reported twelve cases The disease is an atrophic process of the skin of the vulva involving the labia minora, the clitoris, and extending in rare cases to the perineum and the mons veneris, where there may be complete alopecia. The nymphæ amost or quite disappear, the clitoris shrinks, the skin is thickened, white in color, smooth and shiny, exhibiting numerous small abrasions and fissures The vaginal entrance is narrowed. The pathological changes in the skin are a thickening of the epidermis, a disappearance of the rete Malpighii, a sclerosis of the corium, which is infiltrated with small cells, a diminution of the prominence of the papillæ, a complete disappearance of the sebaceous glands, and an almost complete disappearance of the sweat-glands The nerves and nerve-endings are unaltered. Peter[2] describes the disease as a chronic inflammatory hyperplasia of the connective tissue, with a tendency to cicatricial contraction, inflammatory edema of the upper corium layer and of the epidermis, with degeneration of the elastic tissues.

The **symptoms** are often, but not always, an intense pruritus, burning on urination, a feeling of contraction or stretching when walking, and dyspareunia. The contracted vulvar orifice predisposes to extensive tears in labor if the patient is pregnant.

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[1] "*Zeitschr. f Heilkunde*," Bd vi, p. 69 *κραυρόω*, to shrink.

[2] "Monatsschr f. Geburtsh u Gyn," Bd. iii, p 297

The **causes** are obscure: A long-continued pruritus may be followed by kraurosis. It is a disease usually of middle and advanced age, so that senile atrophy may be a predisposing cause. It has been traced to irritating leukorrhea, extensive injuries to the perineum, and to the removal of the ovaries. It is often inexplicable. Epithelioma has developed in a considerable proportion of cases. Kraurosis is apparently, therefore, a predisposing cause. One set of observers has found the disease most frequently in pregnant women; another, in women not pregnant and too old to conceive.

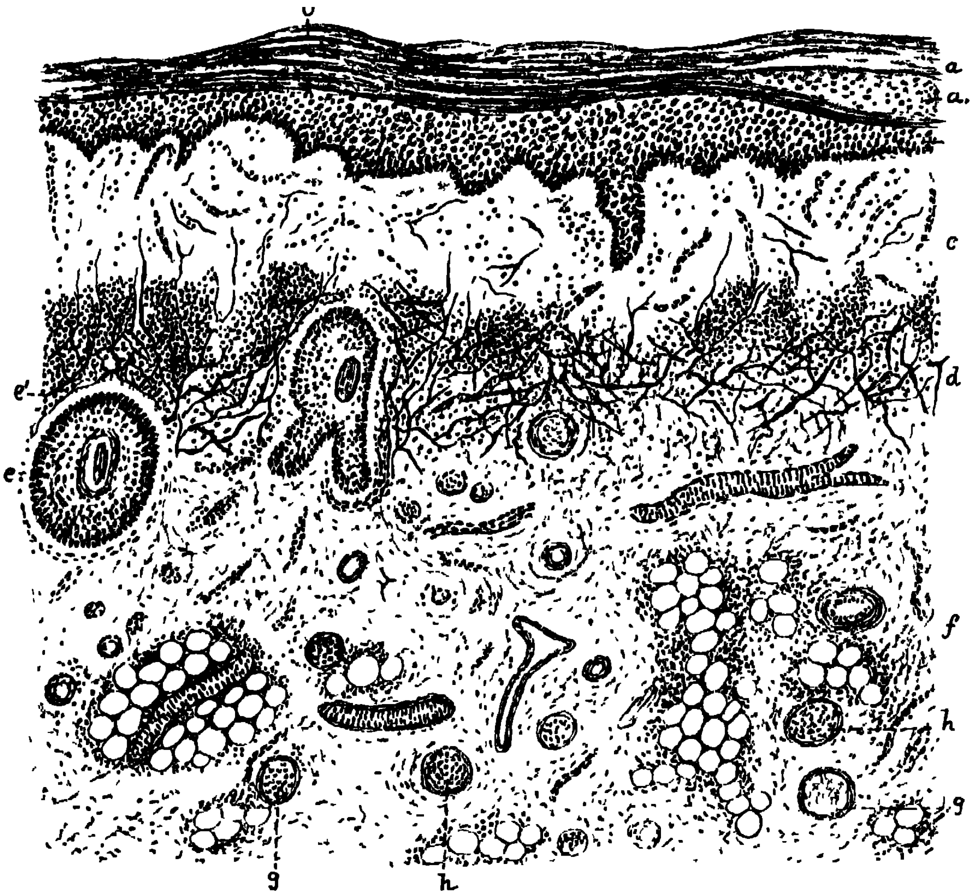


Fig 122.—Kraurosis vulvæ; microscopic section through the excised skin: *a*, Thickened and swollen corneal layer; a_1, spot of hyaline degeneration and leukocytes in corneal layer; *b*, exudate between epidermis and corium; *c*, edema of the upper corium; *d*, shrunken granulation tissue; *e*, *e'*, hairs; *f*, fat; *g*, nerves; *h*, muscle (Peter).

The **treatment** should be the application of astringent and sedative solutions in the incipiency of the disease and the excision of the affected area when the atrophic process has become self-limited.

The **prognosis** is not favorable. Applications are only palliative The removal of the atrophic area has given satisfactory results in cases reported by Martin and others, but there has been a recurrence in several of the operative cases.

Cysts and Benign Tumors of the Labia, Vestibule, and Groins.—**A cyst of the labium majus** may develop in the vulvovaginal gland in consequence of closure of the duct. It is commonly small in size, but may reach extraordinary dimensions. A small cyst should be dissected out without evacuation of its contents. The deep cavity remaining is closed by interrupted sutures, a horse-hair drain (strands of silkworm-gut) being inserted beneath the stitches. If the cyst is very large, its complete excision may be a formidable undertaking on account of hemorrhage. It may therefore be more convenient to excise the greater part of it, packing the cavity that remains and painting the remnant of the cyst-wall daily with iodin until the secreting surface is destroyed by ulceration, when the cavity is allowed to close by granulation.

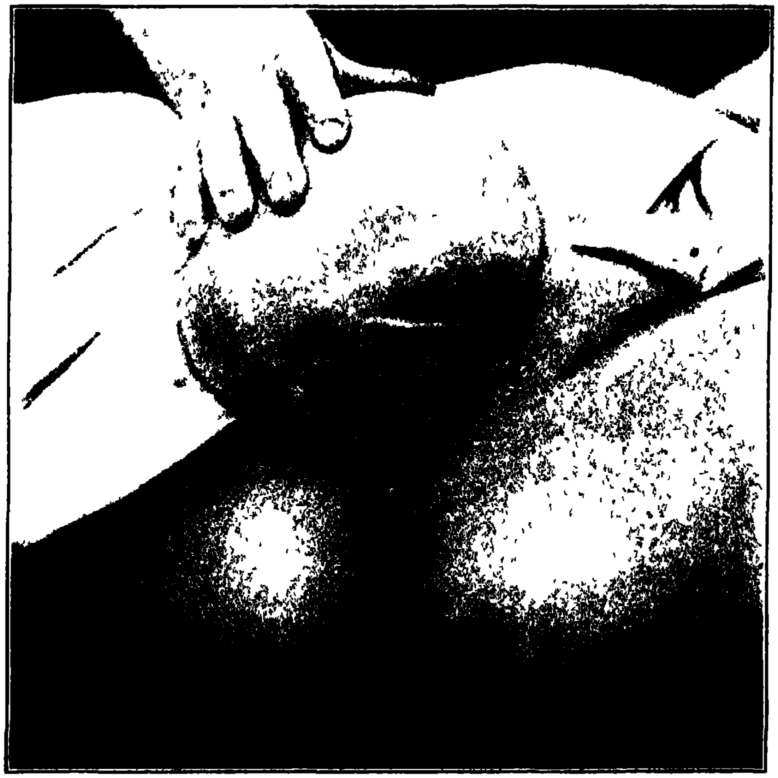


Fig. 123 —Cyst of labium majus (W. J Taylor).

The vulva may be the seat of cysts that occur on the skin anywhere; retention cysts of the sebaceous glands; lymph cysts or dermoid cysts. They are punctured or excised A solid

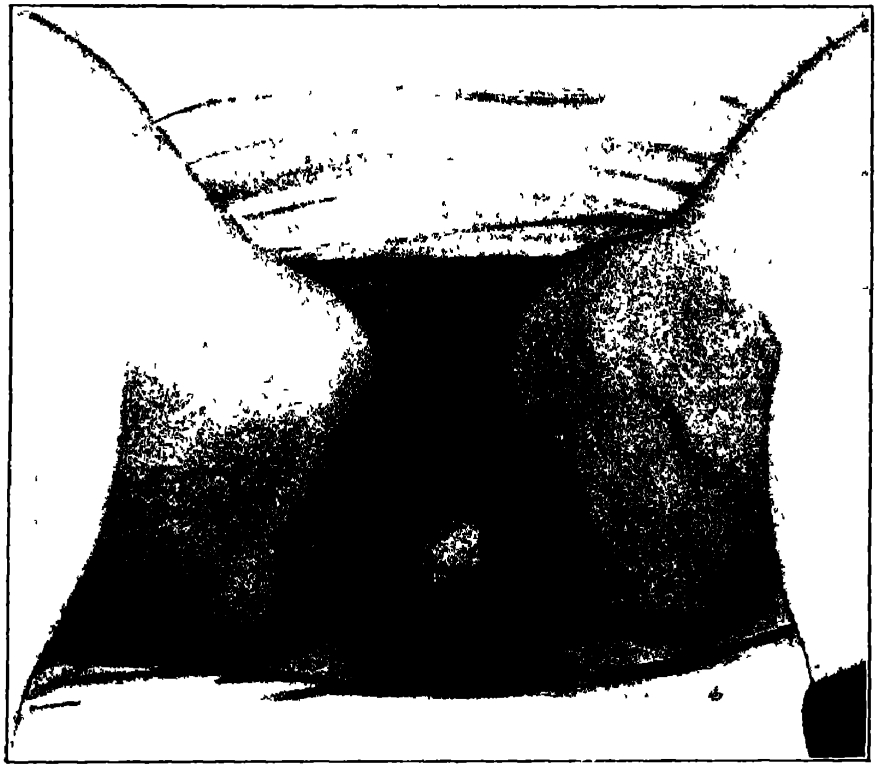


Fig 124.—Cyst of the right labium majus

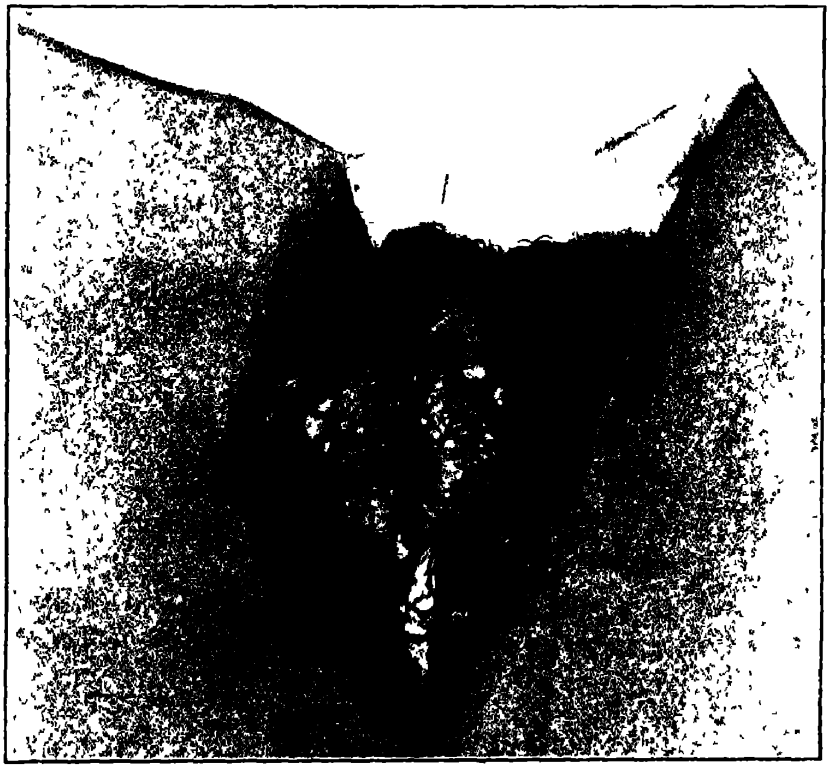


Fig. 125.—Elephantiasis vulvæ.

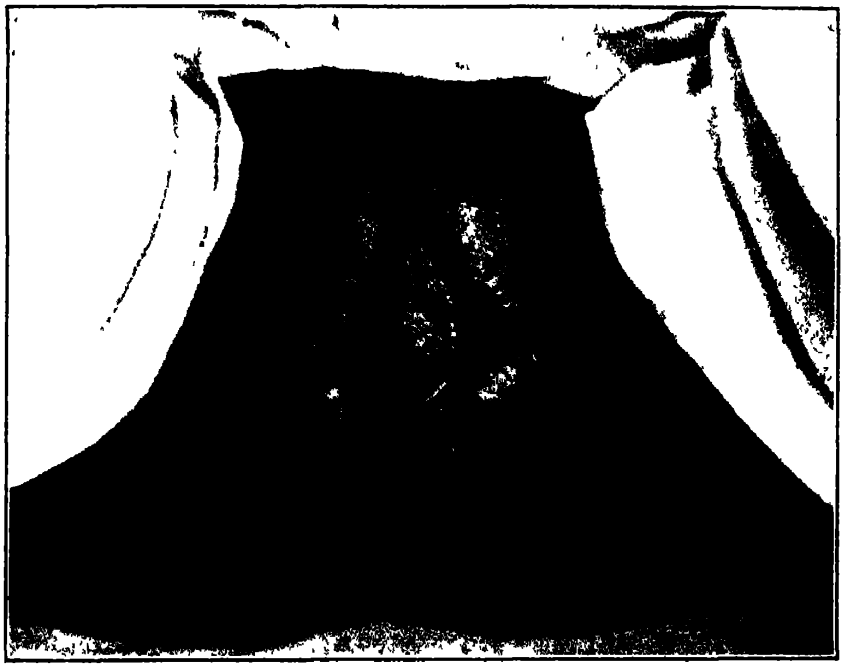


Fig 126 —Elephantiasis vulvæ.

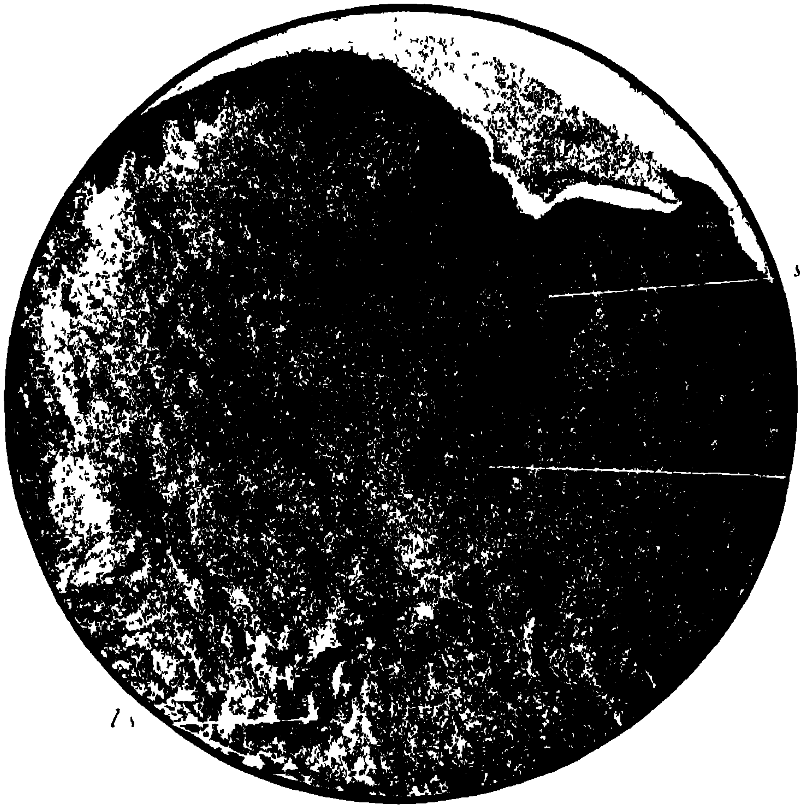


Fig. 127 —Elephantiasis vulvæ : *c.t*, Hypertrophied connective tissue ; *s*, thickened squamous epithelium , *l.s*, dilated lymph-spaces (McConnell and J. C. Hirst)

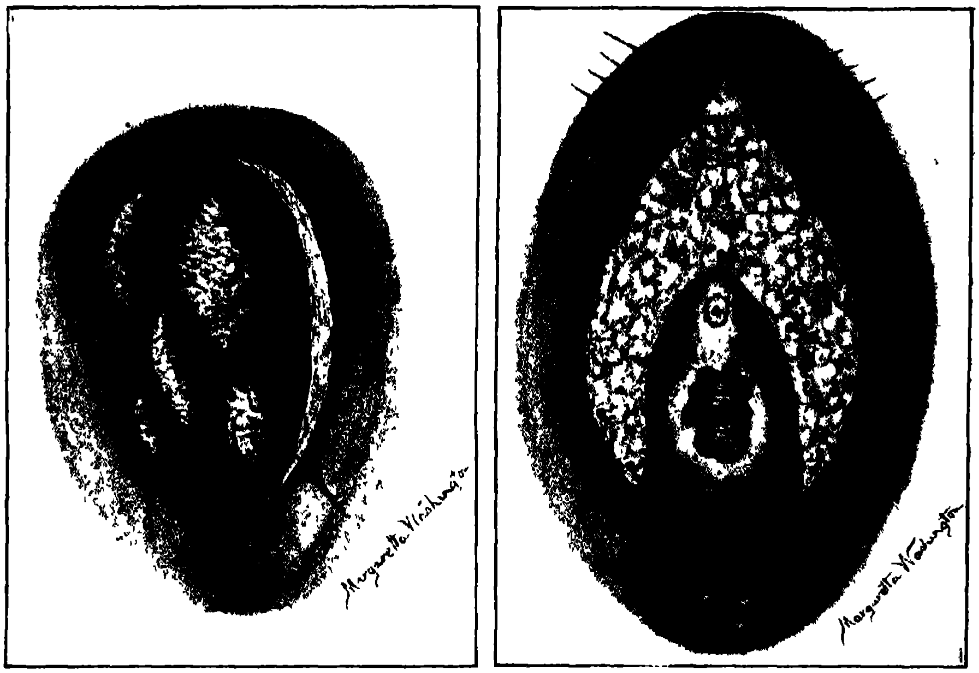


Fig 128.—Operation for elephantiasis vulvæ of moderate degree

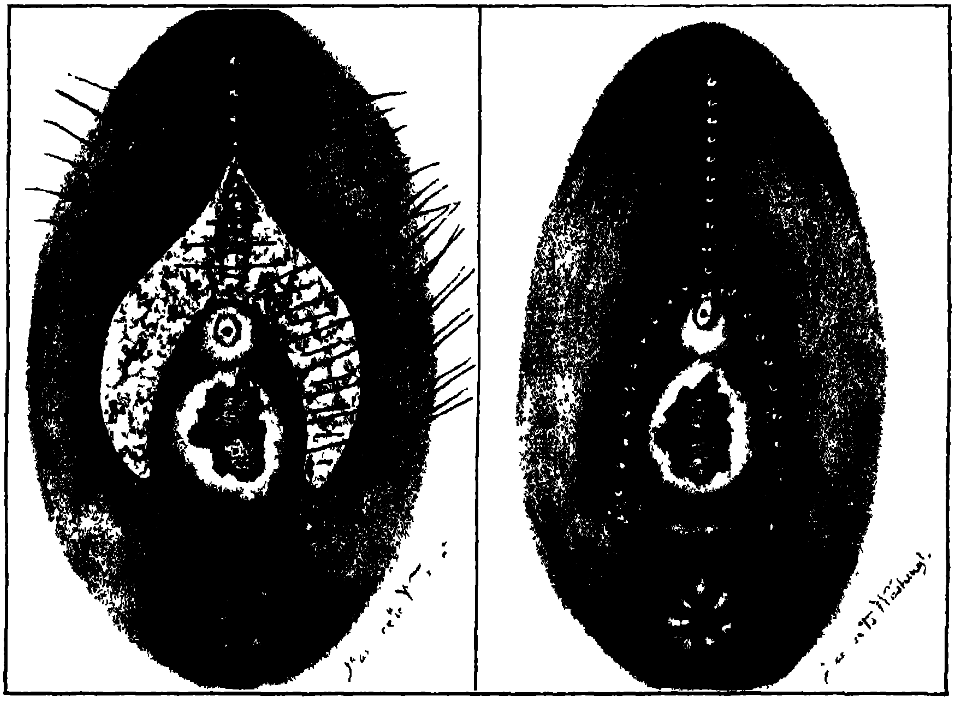


Fig. 129.—Steps in operation for elephantiasis.

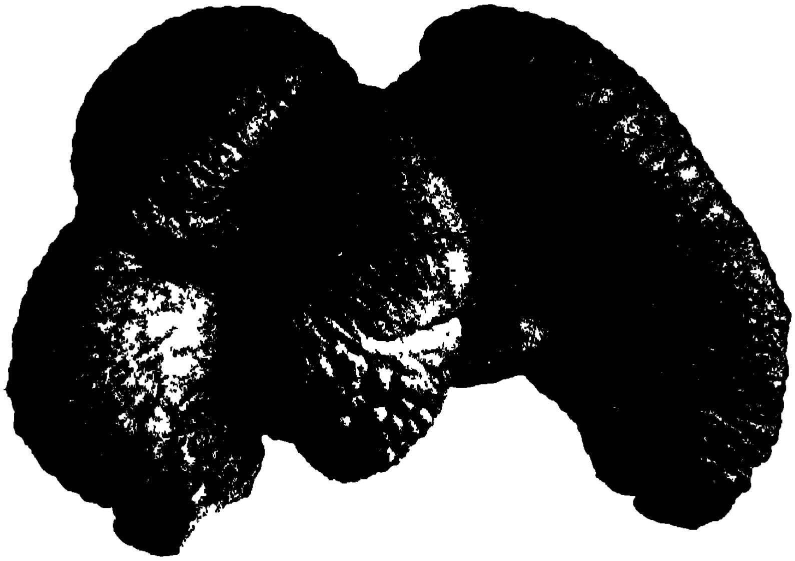


Fig 130.—Labia amputated for elephantiasis.

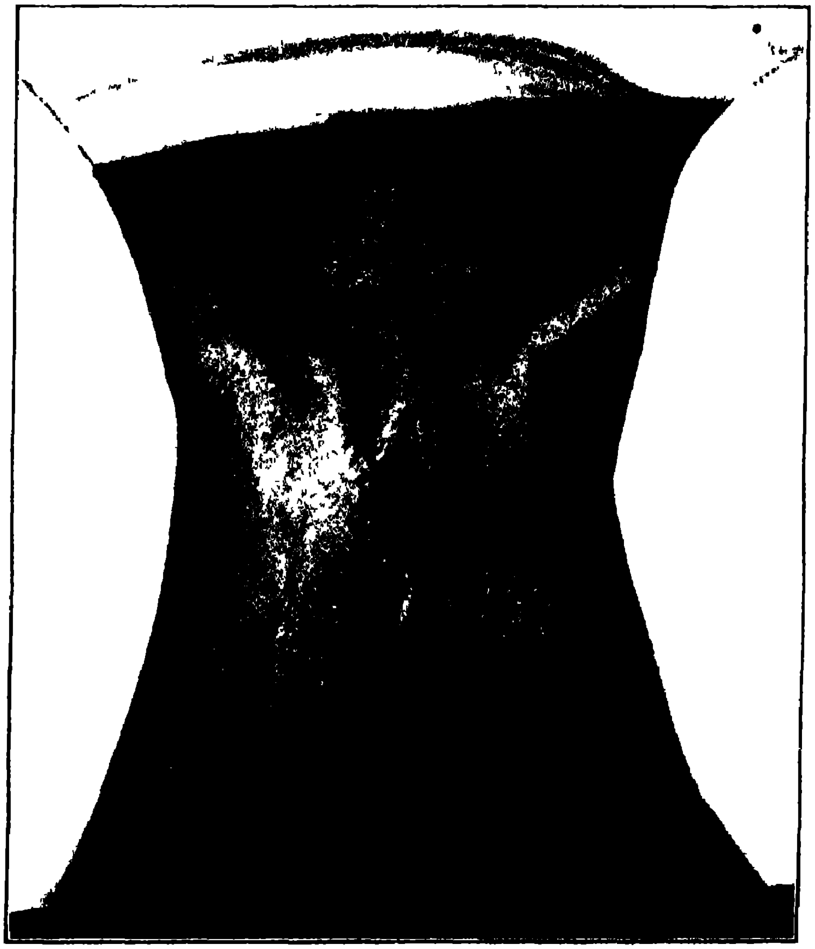


Fig. 131.—Appearance of vulva three weeks after amputation of labia

tumor of the labium minus or majus is usually a *fibroma* or a *lipoma*. The removal of the growth ordinarily presents no great difficulty, especially if it is pedunculated.

Elephantiasis of the vulva is usually seen only in tropical countries. The labia grow to such a huge size that they hang to the knees. The pathological anatomy shows a vast overgrowth of connective-tissue elements with dilated lymph-spaces. The treatment is excision. Special means to control hemorrhage must usually be taken. The best plan is to transfix the base of the growth with skewers and to apply a rubber band above. The blood-vessels are ligated separately, after the excision of the labia, before the skewers and band are removed. Syphilitic hypertrophy of the connective and other tissues of the labia may produce an elephantiasis of moderate degree. It is not uncommon, sometimes yields to specific treatment, and may not require an operation. If the specific treatment is of no avail, however, the mass may be excised, usually with the labium majus and nymphæ on one or both sides and the clitoris.

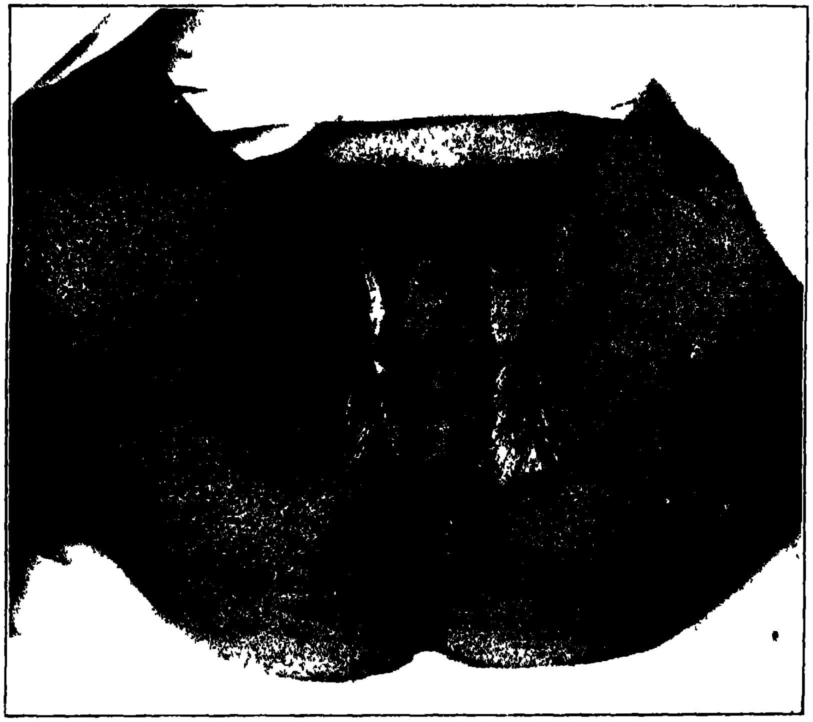
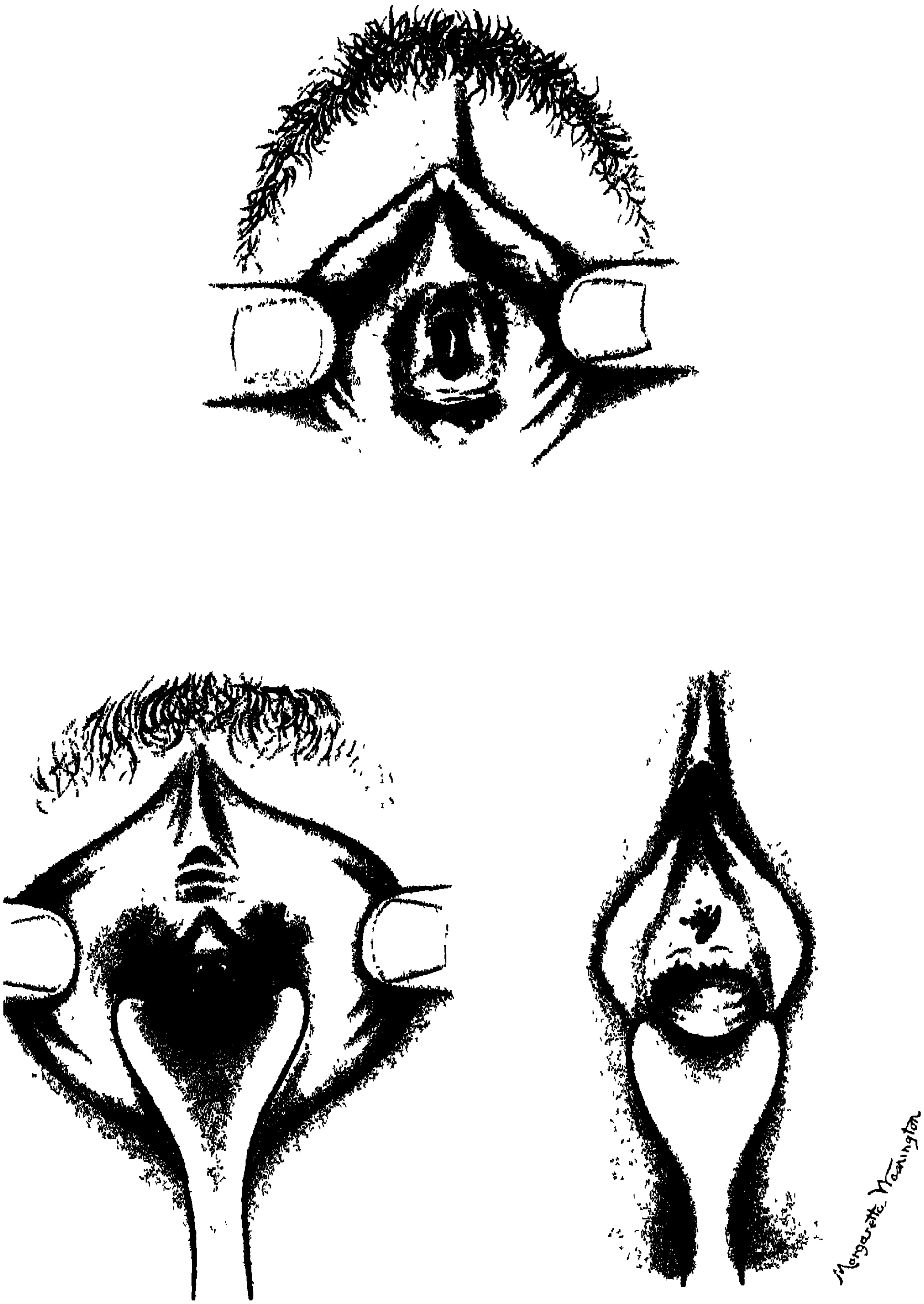


Fig. 132.—Varices of vulva.

Varicocele of the Vulva.—Varices of the labia are seen usually in pregnancy, but sometimes persist after delivery. If the dilated veins are troublesome or threaten to rupture, they may be excised between ligatures as in varicocele of the scrotum.

PLATE 4.



pes of urethral caruncles. 1, Painless caruncle; 2, 3, neuromatous and intensely sensitive caruncles

Urethral Caruncle.—A neuroma or an angioma of the mucous membrane surrounding the external urinary meatus more properly belongs among the vulvar tumors than among the diseases of the urinary apparatus. These growths are a deep scarlet in color, vary in size from that of a millet seed to a cherry, are single or multiple, and grow from the mucous membrane around or within the meatus, occasionally springing from the urethral canal at a considerable distance from its termination. They are usually pedunculated, but may be sessile The pedicle is often long and slender, the tumor hanging between the labia and being laterally compressed by them. In structure they are composed of connective tissue and dilated blood-vessels covered by a thickened mucous membrane with hypertrophied papillæ. In many of the growths there is a hypertrophy and hyperplasia of nerve-fibers and terminals. In these neuromatous tumors there is such excessive sensitiveness that the woman suffers agony when she urinates. She can not bear the slightest touch upon the growth. Coitus is impossible. Even locomotion may cause exquisite pain, and in time there develops a long train of reflex neurasthenic symptoms and a marked deterioration of the general health. The *diagnosis* is made by the symptoms and by an

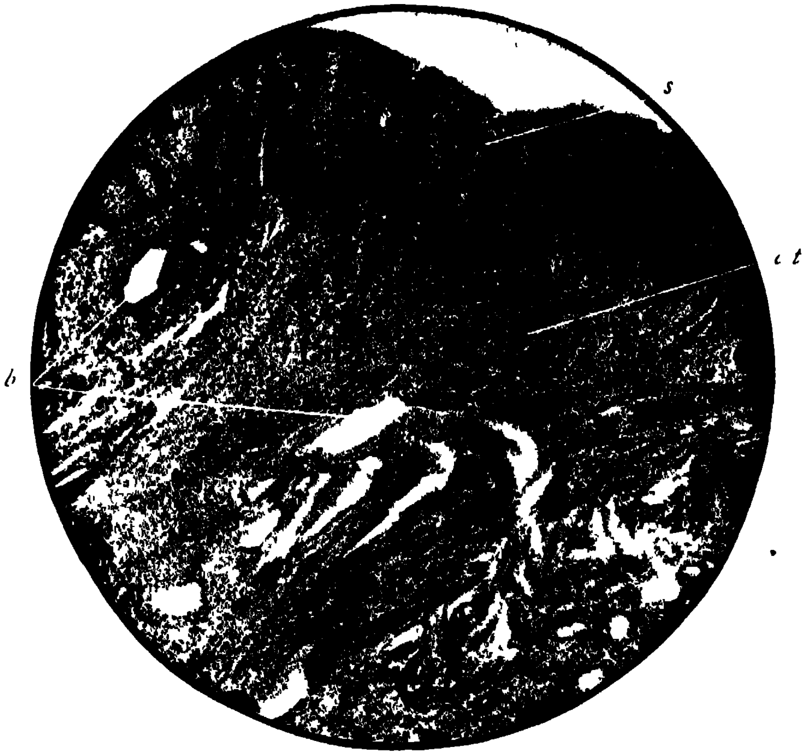


Fig 133.—Urethral caruncle: *s*, Squamous epithelium inflamed and thickened; *b*, dilated blood-vessels; *c.t*, connective tissue (McConnell and J. C. Hirst).

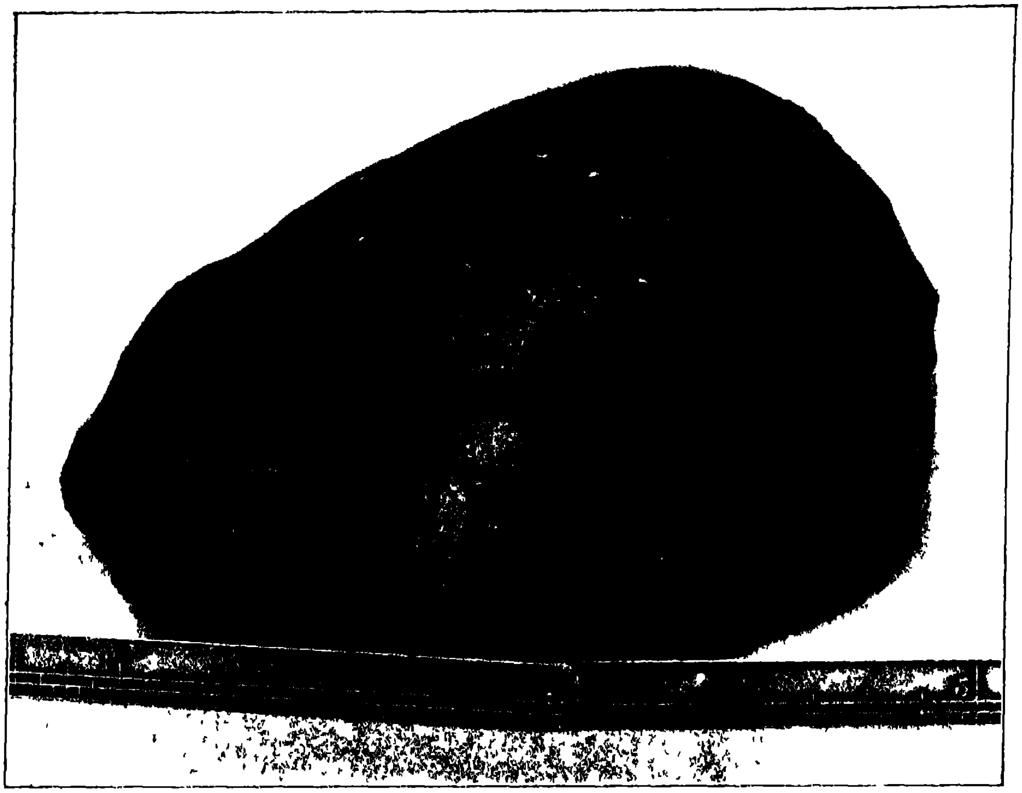


Fig 134 —Fibromyoma of round ligament

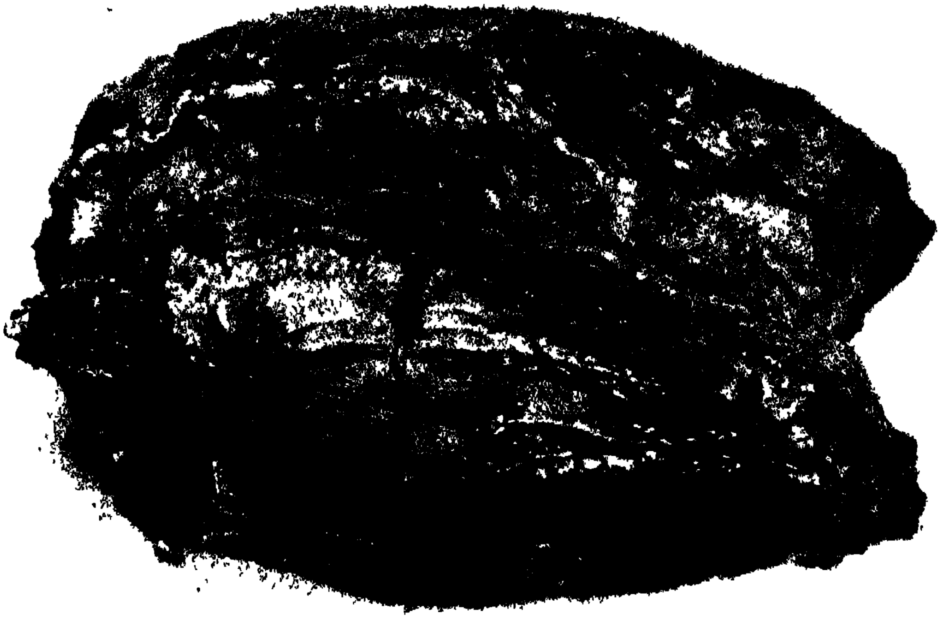


Fig. 135 —A fibromyoma of the round ligament in the inguinal canal Weight 6½ ounces.

inspection of the vulva. The *treatment* is the excision of the growth or growths, care being taken to pull them outward by a rat-toothed forceps, which seizes them at the base, and to excise at least an eighth of an inch of healthy mucous membrane with them. Otherwise they will recur. The small wound is closed with catgut. It is much more satisfactory to operate upon the patient anesthetized, but it is possible to remove the growth after cocainization with a 10 per cent. solution. Instead of removal by excision the caruncle may be destroyed by cauterization with the electrocautery needle, which is plunged into it a number of times down to its base. Cocainization of the part makes the operation painless, and it may be carried out as an office treatment.

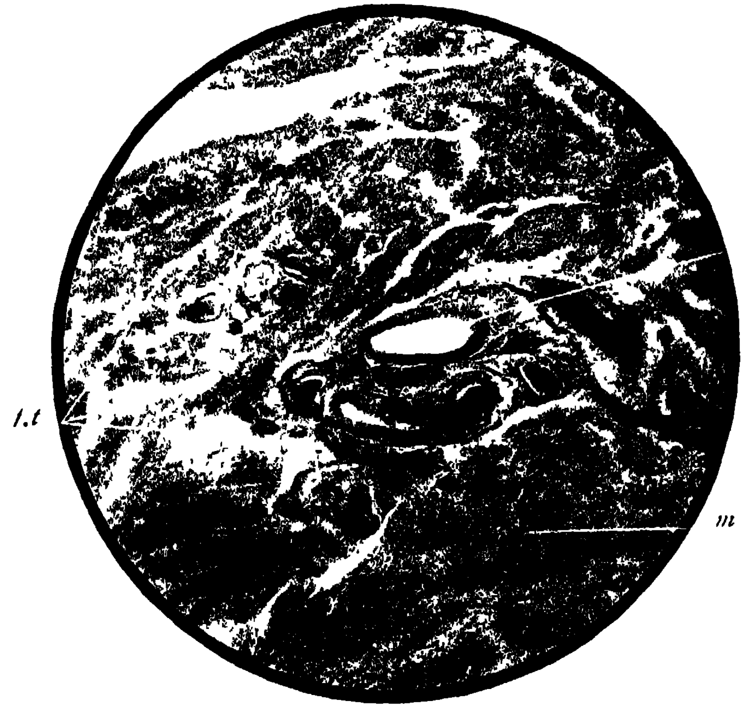


Fig 136.—Fibromyoma of round ligament; tumor weighed 6½ ounces. *f t*, Fibrous tissue, *m*, muscular tissue; *v*, blood vessel (McConnell and J. C. Hurst)

If the caruncle is an angioma without neuromatous elements, it is painless, and the patient is unaware of its existence, which is accidentally discovered in the course of a gynecological examination. The removal of such a growth is unnecessary.

The groin, the inguinal canal, and the upper portion of the labium majus may be the seat of a solid or cystic tumor, which may be a *fibromyoma*, a *lipoma*, a *sarcoma*, an *adenomyoma*, a *cystofibroma*, a *dermoid*, or a *hydrocele of the round ligament*. The first is spherical, possibly irregular in outline. It may be small in size, confined to the inguinal canal, or it may grow upward toward the umbilicus or outward toward the ilium. It may be densely adherent to the anterior superior spine of the ilium and to the peritoneum which clothes its under surface, so that its removal may necessitate a large opening into the peritoneal cavity. It is stony hard in feel, and presents none of the symptoms of inguinal hernia, except the tumor in the groin. The incision for the removal of the tumor is made like that of an Alexander's operation parallel with the Poupart's ligament, but much longer and through the deep fascia. The wound must be carefully and firmly approximated, layer by layer, with continuous sutures of durable catgut to prevent hernia.[1]

Hydrocele of the round ligament is a cystic tumor in the canal of Nuck. It may communicate with the peritoneal cavity, in which case the swelling disappears on pressure or is increased if the intraperitoneal tension is augmented, as in coughing or straining If the canal is closed by adhesive inflammation at the internal ring, the tumor is not affected by intra-abdominal pressure, is unmistakably cystic in feel, and is not tender on moderate pressure Exploratory puncture with a hypodermic needle withdraws a clear serous fluid. If the swelling is reducible, a truss should be worn ; if it is not, the sac may be punctured and a few drops of iodin injected to secure its obliteration. The most satisfactory treatment is excision of the entire sac, which is dissected out of the inguinal canal. The wound is closed by continuous catgut sutures, layer by layer. Cases of hematocele and hematoma of the round ligament have been reported.[2]

Rodent Ulcer of the Vulva.—L'esthiomène (Huguier), ulcus rodens vulvæ (Virchow), and lupus vulvæ are names bestowed by various observers upon an ulcerative process, found only, as a rule, in prostitutes, beginning in the fossa navicularis, extending to the labia and urethra, resulting in rectovaginal fistulæ, and destruction of the lateral urethral walls. There is a sharp dividing line between the diseased and healthy surfaces, but in the latter there is extensive infiltration and edema and in time an elephantiasis. There may be stricture of the rectum below the fistulous opening in the bowel In consequence of the destruction of the lateral urethral walls, the lower wall of the urethra hangs in front of the vaginal entrance. There is little left of the urethral canal, and its mucous membrane is covered by squamous epithelium. There are not necessarily tubercles in the ulcerated area, and the tubercle bacilli can not be found except in accidental or secondary infection. The patient's general health is not affected. The causes to which this peculiar disease has been ascribed are violent and excessive coitus, especially if the vulva is situated more anteriorly than normal; the removal of the inguinal glands in cases of suppurating buboes (F. Koch); a pre-existing elephantiasis, uncleanliness, and an old syphilitic infection.

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[1] Nebesky has collected 30 cases of fibromyomata, to which the author's 2 cases should be added, 18 cases of fibroid tumors with epithelial structures in them, 2 dermoids, 3 lipomata, and 4 sarcomata. "Monatsschr. f Geb. u. Gyn.," April, 1903.

[2] Koppe, "Centralbl. f. Gyn.," 1886, vol. x, p. 179. Gottschalk, *ibid.*, vol. xi, p. 329.

The **prognosis** is unfavorable. In the earlier stages cleanliness and rest have effected a cure. Later, cauterization with strong caustics is indicated; excision of hypertrophied areas in which elephantiasis has developed may be called for. In one case the diseased area posteriorly and the constricted bowel were removed, an inguinal anus being established by fastening the lower end of the sigmoid flexure to an opening in the abdominal wall.

Tuberculosis of the Vulva.—Lupus Vulvæ.—According to Koch, the only ulceration of the vulva to which the name lupus should be given is dependent upon tubercular infection demonstrated by the presence of tubercle bacilli.

Tubercular ulceration of the vulva is very rare. The disease comes under the physician's observation only in the ulcerative stage, when upon the perineum, the labia, or in the vestibule a grayish ulcer of varying size may be seen, exhibiting tubercles in process of cheesy degeneration, and friable, feebly nourished granulations, with a serpiginous edge. Tubercle bacilli are found in the recent ulcerations, but may be absent from the old. There is an attempt at cicatrization in the older portions of the diseased area never seen in cancer, while nodes shortly becoming ulcerated on the surface mark the advance of the disease. According to Veit, there is never an elephantiasis of surrounding tissues on the border of the tuberculous inflammation, as in the labia, the nymphæ, and the clitoris, lupus thus being distinguished from rodent ulcer; but in two cases in which an operation was performed for elephantiasis of the clitoris tuberculosis was discovered on histological and bacteriological investigation—perhaps, however, as a secondary infection. The explanation of the infection is not easy to find. It has been attributed to coitus with a tubercular man, to tuberculosis of the lungs or other organs, especially the internal genitalia, the urinary tract, and the bowel; to direct inoculation with finger-nails, and even to the atmosphere. Lupus vulvæ may be the initial lesion of tuberculosis, but it is more likely to be secondary to other tubercular processes in the body. It occurs most frequently in women from twenty to forty, but has been seen as early as the eighth and as late as the eightieth year.

The **treatment** is the same as for lupus elsewhere; excision with the knife or curet, deep cauterization with caustics, or, best of all, with the *x*-rays, and the actinic ray, the surrounding healthy tissues being protected by a lead screen or zinc foil, and the ulcerated or diseased area being exposed to the electric and ultraviolet rays eight to ten minutes daily

The prognosis depends upon the association of other tubercular lesions in the body. If the tuberculosis of the vulva is primary, a cure may confidently be expected. If there is general miliary tuberculosis, or if it is localized also in the lungs, peritoneum, internal genitalia, bladder, or bowel, the lupus vulvæ is likely to recur, or to persist until the patient's death.

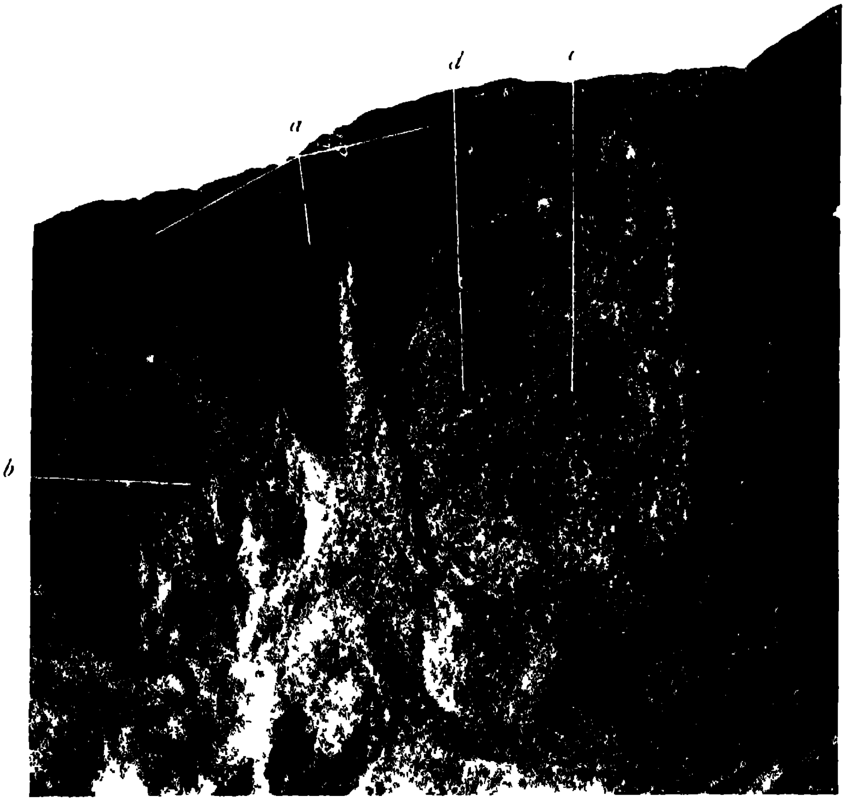


Fig. 137.—Microphotograph of section from a case of lupus vulvæ: *a*, Squamous epithelium, *b*, subcutaneous connective tissue; *c*, tubercle; *d*, giant-cell (McConnell and J. C. Hirst).

Carcinoma, Sarcoma, and Syphilis of the Vulva.—The vulva is less frequently the seat of cancer than any other portion of the genitalia Winckel saw it only twice in 10,000 women examined. He collected 62 cases, 40 in women over fifty years of age, 6 in women under forty A few cases of adenocarcinoma of the vulvovaginal gland and 2 of Skene's ducts of the urethra have been reported; with these exceptions cancers of the vulva are

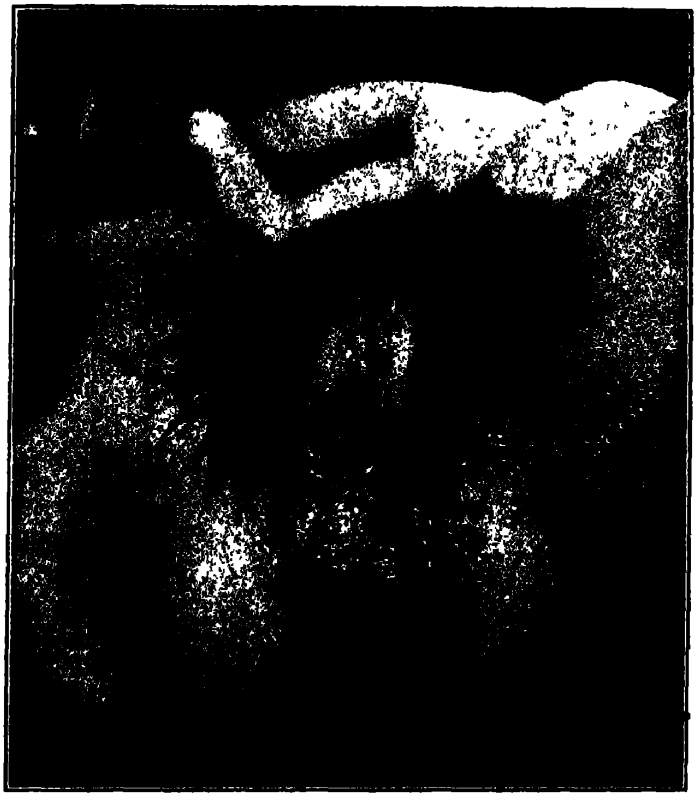


Fig. 138.—Epithelioma of vulva.

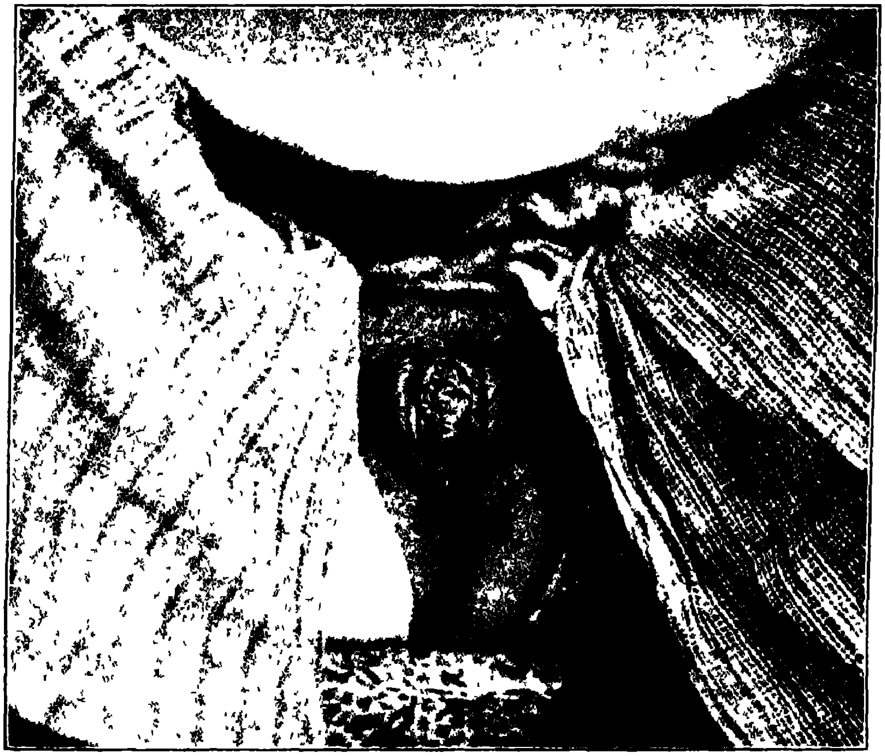


Fig. 139.—Epithelioma of vulva

epithelioma. The clitoris and the labia majora are the usual sites. A nodule first appears with small neighboring nodes; ulceration of the surface quickly follows. The inguinal glands are soon involved, and the epithelioma of one labium very shortly spreads to the opposite side. There is a rapid extension of the malignant infiltration and ulceration to the perineum, the mons veneris, and up the vagina, especially along the course of the urethra The squamous epithelium of the vulva has a strong power of resistance against all infections, so that an epithelioma of the vulva may develop slowly and the prognosis is better than in cancers of the vagina; but at the best the patient's outlook is none too good. Recurrence has been noted in a large percentage of the cases, but the proportion of permanent cures has markedly increased since the adoption of the good surgical principle that the inguinal glands should be removed with the tumor, whether they are demonstrably diseased or not.

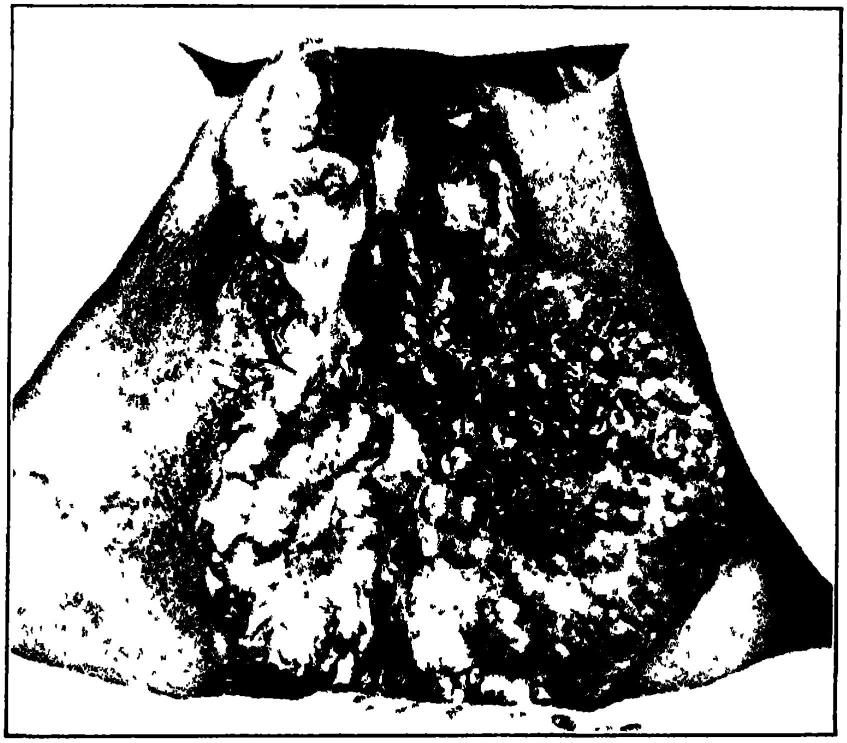
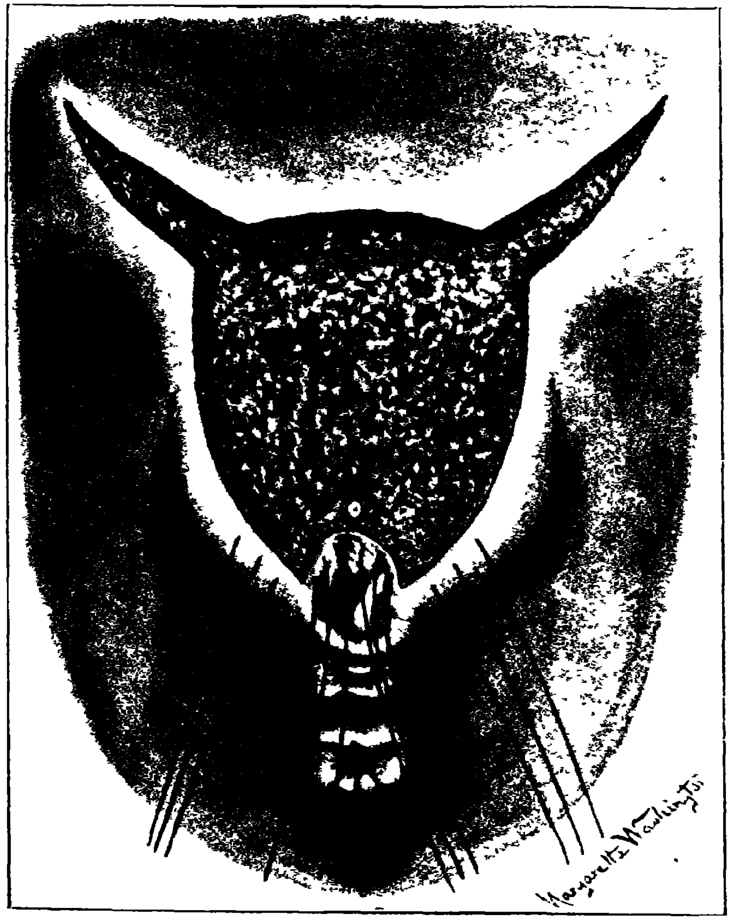


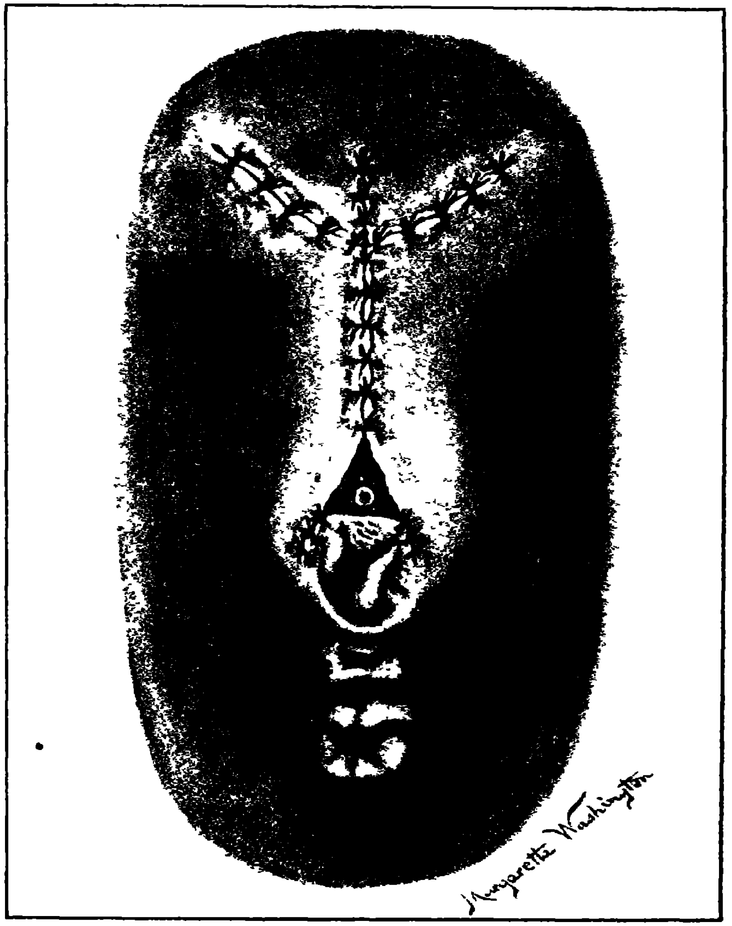
Fig. 140.—Inoperable epithelioma of vulva.

The **treatment** should be an early and complete excision of both labia, the clitoris, the lower portion of the mons veneris, and the inguinal glands. The wound has somewhat the shape of a W. It can usually be brought together by interrupted sutures, but it may be necessary to remove so much tissue that a portion of it must be allowed to gape and to heal by granula-

PLATE 5.



Removal of the labia, the clitoris, and the outer third of the urethra for epithelioma of the labia majora, extensions of the wound to permit the removal of the inguinal lymphatic glands



Closure of the wound, leaving a gap around the urethra to granulate, as complete closure was impossible.

tion It has been found necessary in some cases to remove the whole urethra and to resect the descending ramus of the pubis.

Sarcoma of the vulva is very rare. It is usually of the melanotic variety. The tumor is rounded in shape, has reached the size of a cocoanut, though it is usually of moderate dimensions, and may be pedunculated. The labia and the urethral region are the sites from which the growth develops. Two cases have come under the author's observation. One appeared directly after labor in the Maternity Hospital of the University of Pennsylvania, as melanotic nodules on the labia. Within four weeks the patient died of general sarcomatosis, with melanotic sarcoma of the liver, kidney, breast, and the subcutaneous connective tissue everywhere. The other case was a sarcoma of the left labium minus. The growth was excised. There was no local recurrence, but general sarcomatosis appeared in six months.

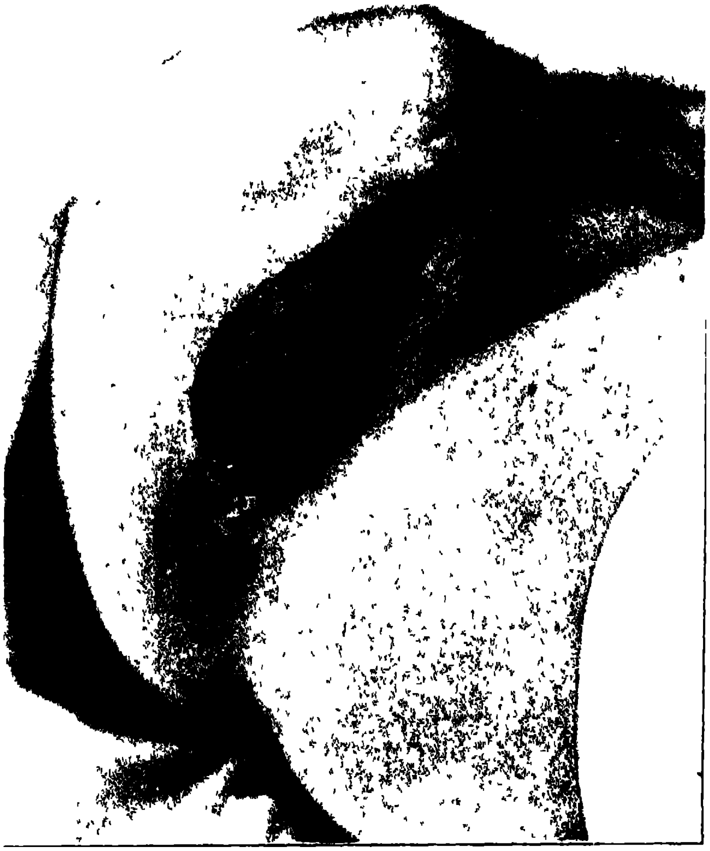


Fig 141.—Sarcoma of left labium minus

The growth should be removed from the vulva as soon as detected, but recurrence and metastases are to be expected. Reed,[1] however, reports a permanent success.

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[1] "Text-book of Gynecology," p 230, 1901.

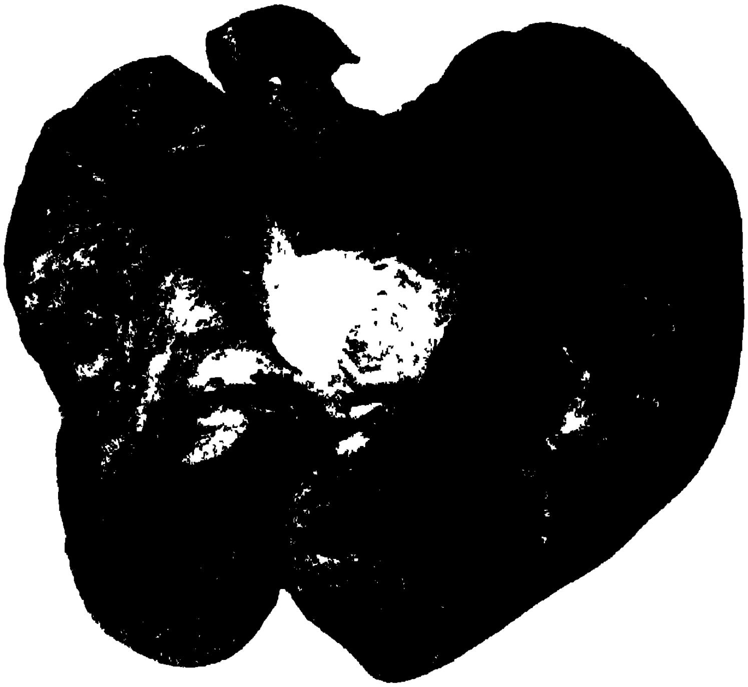

Fig. 142 —Sarcoma removed and split open

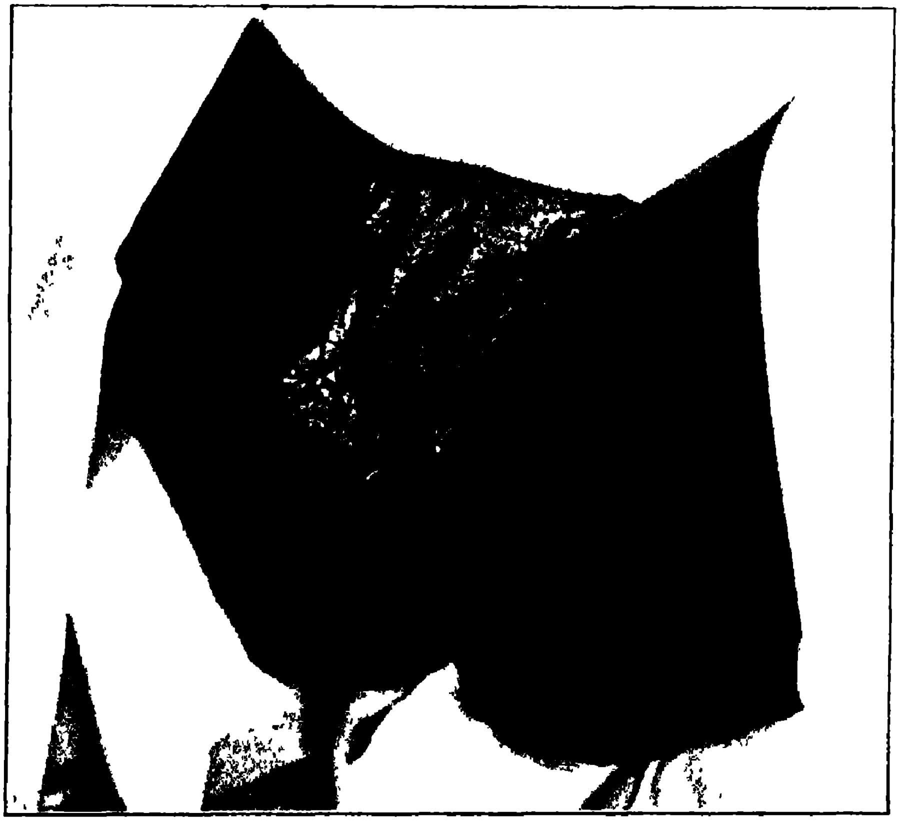

Fig. 143 —Syphilis of the vulva.

Syphilis of the vulva is considered in this connection on account of its resemblance to cancer in some of its manifestations In an early stage of the disease, with the initial sore on a labium, mucous patches within the vagina, and flat condylomata on the buttocks, thighs, and vulva, the appearance is distinctive enough and could not well be mistaken for anything else. But the syphiloderm of an old infection can not be distinguished from cancer at first sight; not indeed until specific treatment has been tried or a portion of the growth has been subjected to microscopical study. Mercury and iodid of potassium have often a wonderful effect on old vulvar syphilis, but if the elephantiasic processes accompanying syphilitic vulvitis are well advanced, it may be necessary to excise the growth. Specific treatment, however, should first be tried. Local applications, best in the shape of antiseptic and astringent dusting-powders, diminish the discomfort and uncleanliness of the moist secreting surfaces of the

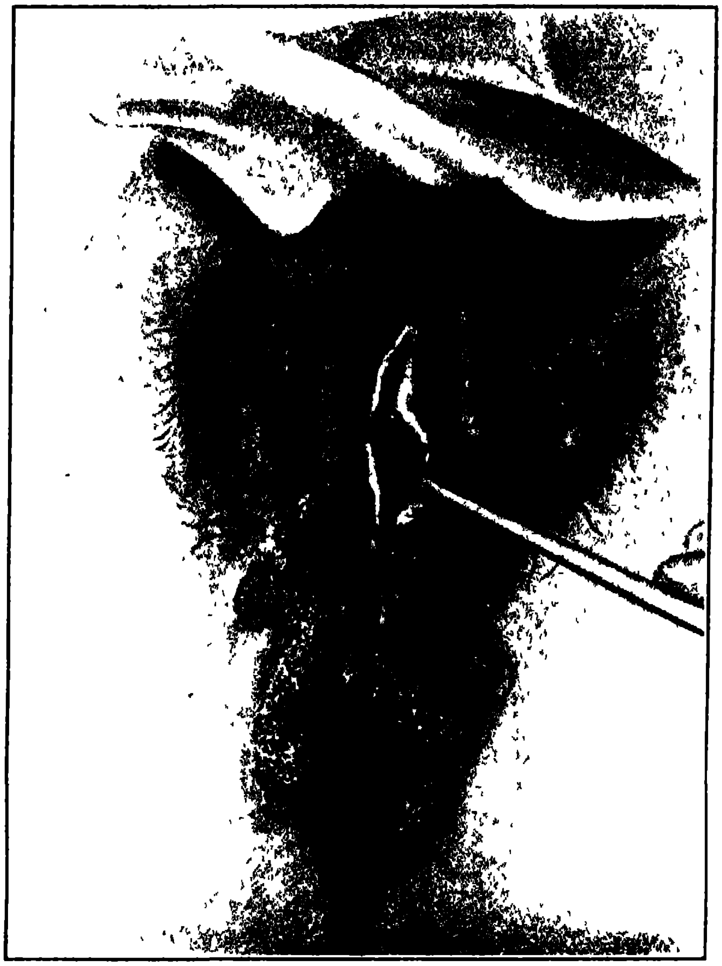

Fig. 144 —Syphilis of the vulva

syphilitic growths until it is determined whether medicinal treatment will suffice or surgical intervention is required.

Pudendal Hernia.—Inguinal hernia in women does not differ from the same condition in men, except that the abdominal contents descend into the labium instead of the scrotum, and must be differentiated from tumors peculiar to that locality. The symptoms and treatment are the same in both sexes. There is a pudendal hernia peculiar to women in consequence of a defect in the pelvic fascia and the levator ani muscle anterior to the broad ligament. A peritoneal pouch containing omentum alone perhaps, but more likely intestines, descends along the lateral vaginal wall to the posterior end of a labium majus. If the intra-abdominal pressure is increased from any cause, as by a pregnant uterus, an enormous enterocele may completely block the vaginal canal, giving rise to a constipation approaching obstruction of the bowels and forming an obstacle in labor of a serious nature. The coverings of the hernia have burst, allowing the intestines to escape The vaginal and labial tumors have the physical signs characteristic of a hernia: tympany on percussion, recession within the abdominal cavity on pressure, unless the intestines are adherent to the hernial ring, and a characteristic doughy feel with gurgling on palpation.

The palliative treatment is first to reduce the hernia and then to prevent its recurrence by the use of a globe pessary, which is retained either by a T-bandage or napkin, or by a stem attached to the globe supported by a specially constructed belt. (See the apparatus for prolapse, p. 68).

The radical treatment for vaginal hernia is carried out by the following steps: an incision in the lateral vaginal vault over the site of the ring which can be felt; opening the peritoneal pouch, release of the intestines from adhesions, if they exist; excision of the peritoneal pouch; freshening the edges of the hernial ring; placing closely set interrupted sutures of silkworm-gut through the whole depth of the wound, closing the ring with a running buttonhole stitch of catgut (formalin); finally closing the wound by uniting the interrupted sutures, which are removed in two weeks.

Diseases of the Clitoris.—The clitoris may be the seat of cystic and solid tumors, and may be involved in tuberculosis and elephantiasis of the vulva. There may be adhesion of the prepuce to the glans, with retention of smegma and a consequent irritation causing severe reflex symptoms or nymphomania. Concretions have been found under the prepuce in cases of long standing. It has been claimed that preputial adhesions which prevent a free exposure of the glans clitoridis account for a loss of sexual feeling, which returns when the glans is freed (Bernardy). To expose the glans and break up adhesions, a surgeon's probe or a grooved director is used, a point of entrance being gained with the end of the instrument. The separated surfaces are well cleansed and thoroughly packed to prevent a recurrence of the adhesions. The packing must be renewed every other day for some time until the abraded surfaces are well covered with healthy mucous membrane.

Tumors of the clitoris are cysts, enchondromata, horny epithelial growths, epitheliomata, elephantiasis, or simple hypertrophy. Whatever their nature, the treatment is the same, removal of the growth and usually with it the whole clitoris Clitoridectomy is performed by making a circular incision around the prepuce and the lower surface of the free end of the clitoris, a linear incision toward the pubis over the back of the clitoris, which is then dissected out and amputated at its base, bleeding vessels being caught and tied and the wound united with close-set interrupted sutures or a continuous catgut suture in tiers, as the operator prefers.

Injuries of the Vulva.—The vulva, like other external portions of the body, is subject to incised, punctured, lacerated, and contused wounds, but injuries in this situation are rare. They are usually due to a fall astride some hard object, like the frame of a bicycle, the back or arm of a chair Children may run splinters into the vulva while sliding on a board The author has seen a very extensive contused wound of the vulva from a kick. There are three peculiarities of injuries to the vulva deserving special consideration One is the likelihood of profuse hemorrhage; the second is the possibility of lacerations in violent coitus; and the third is the possibility of a lacerated wound extending through the anus into the rectum. The hemorrhage may be frank and so profuse as to be fatal, especially if the woman is pregnant. Pressure controls the bleeding until the vessels can be tied or the wound is closed by a continuous catgut stitch. The hemorrhage may be subcutaneous, resulting in a labial hematoma. The tumor has a characteristic appearance. The color of the blood usually shows through the skin. The size is rarely larger than that of a clinched fist, except in a pregnant or puerperal woman. Rest and the continuous application of an ice-bag control the exudation of blood and keep the tumor from reaching larger dimensions. Absorption of the extravasated blood may be expected. If this result is not secured within a reasonable time (a week), or if meanwhile evidences of inflammation appear, the skin over the hematoma should be incised, the blood-clot turned out, the cavity irrigated and packed with iodoform gauze. The

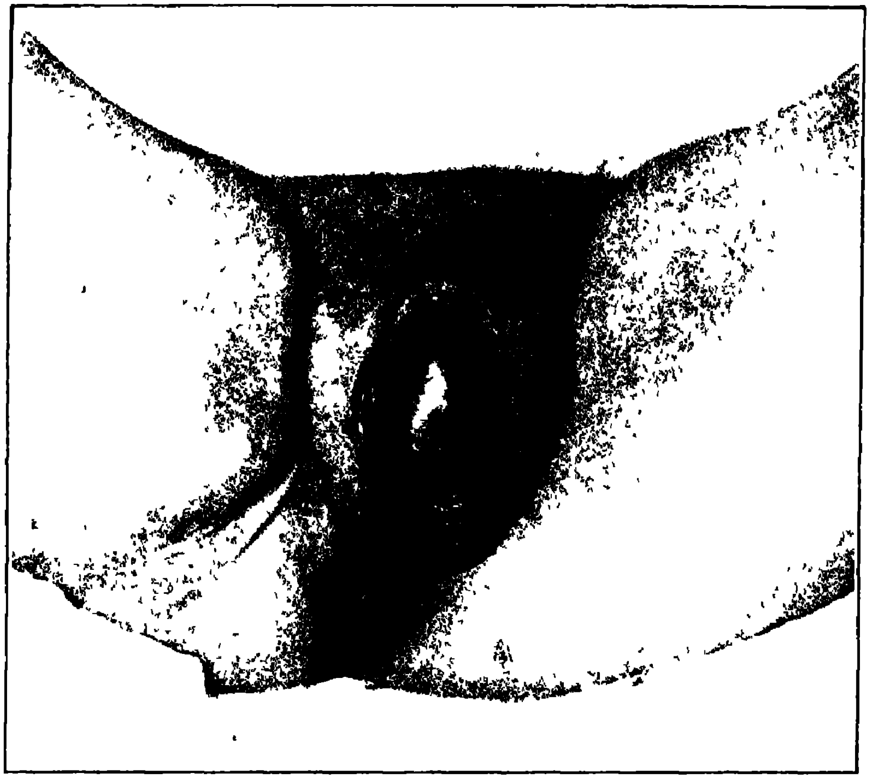

Fig 145 —Hematoma of the vulva.

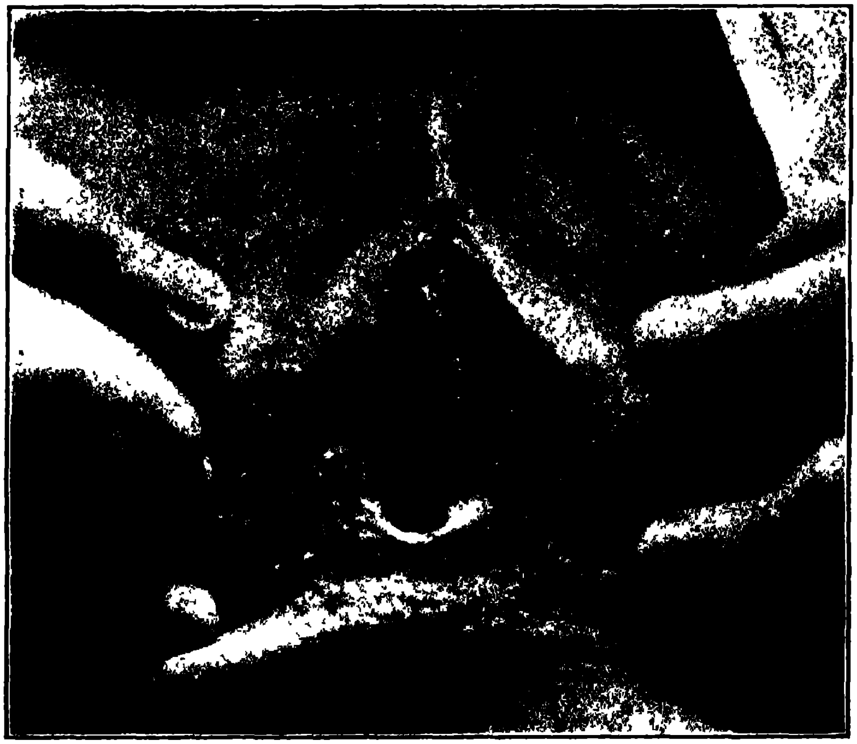

Fig 146.—Vulvorectal fistula due to violence in coitus

irrigation and packing must be repeated daily until the cavity is closed by granulation. The prognosis of a labial hematoma is not serious except in a puerpera.

Injuries due to coitus are rare. They are usually a laceration of the hymen with profuse hemorrhage. A woman may almost bleed to death on her wedding night from this cause. A vulvar tampon checks the hemorrhage at once, until catgut, needles, and a needle-holder can be prepared to close the wound and to surround the bleeding vessels. The author has seen three serious injuries from coitus. A child nine years old was admitted to the hospital with a complete laceration of the perineum and a chancre She had been raped and infected by her uncle. In two cases, one in the Philadelphia Dispensary, the other in the Howard Hóspital, there was at the base of the hymen posteriorly a perforation which extended upward and backward into the rectum Such cases should be treated by excising the hymen, freshening the edges of the vulvorectal fistula, and closing it with close-set interrupted sutures of silkworm-gut

Complete lacerations of the perineum from violence and not in labor are rare.[1] Parrish reported one in a female infant from the tip of a forceps blade, which an inexpert operator had endeavored to apply to what he thought was the head. Other cases have been due to falls on objects like a rake handle or a hay knife; to the horn of a goat and to a kick. There is always profuse hemorrhage and profound shock The injury is repaired by the same operative technic required in the primary repair of a complete tear after labor.

COCCYGODYNIA.

In the "New Orleans Medical and Surgical Journal," for May, 1844, Dr. J. C. Nott, of Mobile, Ala, described an operation by which the last two coccygeal bones were removed for what he called "neuralgia of the coccyx." The patient, a young woman, had had a fall four years before, but had suffered pain in the coccyx for only ten months. From the description of her symptoms she was evidently profoundly neurasthenic. The last coccygeal bone was described by Dr. Nott as reduced to a mere shell in consequence of caries. The operation was followed by great improvement in the symptoms, both locally and generally. Nott's discovery was apparently soon forgotten. Fifteen years later, in 1859, Sir James Y Simpson described a disease of the coccyx which he said could nowhere be found mentioned in books, and for which he proposed the name "coccyodynia."[1] He advocated, as the treatment for the disease, subcutaneous section of all the tendinous and muscular attachments of the coccyx, or possibly the removal of the coccygeal bones.

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[1] "Complete Lacerations of the Perineum in Young Girls," J. Wesley Bovee, "Amer Jour. of Obstet," No 4, 1900.

Scanzoni, in 1861, referred to the disease in a German periodical.[2]

It has been declared that coccygodynia is never seen in men. This statement is not quite correct. Prof W. W. Keen writes me that he has no recollection of such a case in his practice, and can find no reference to it in his card catalogue of patients. Dr. W J Taylor, however, has operated upon two neurasthenic men for coccygodynia. In the "Ephemerides Medico-Physicæ," there is the record of a case of coccygodynia in the male from a fall on the buttocks. Men are almost immune because they do not bear children, because the coccyx is better protected in them than in women from external violence by the higher situation of the bone and the closer approximation of the tuberosities of the ischia, and because there are not the same development and mobility of the muscles of the pelvic floor and of the gluteal region.

Three-quarters of the cases are due to injuries in labor. Coccygodynia may be the result of a fall or a diseased condition of the joint between the first and second bones in women who have not borne children and have not met with an accident There is frequently temporary pain in a coccygeal joint following labor, due no doubt to a strain of the anterior ligaments of the bone, but disappearing after some months.

Etiology and Pathological Anatomy.—The pain in the coccygeal joints after labor is easily understood. The backward displacement of the bone by the fetal head in exceptional cases ruptures a joint, breaks the anterior longitudinal ligaments of the bones, or if there is complete ankylosis of all the joints, may cause an oblique fracture of a coccygeal vertebra itself. The same explanation suffices for coccygodynia after a fall on the buttocks, except that the force is exerted in an opposite direction; the bone is usually driven violently inward instead of outward, and the posterior ligaments are ruptured After the accident, no matter how caused, the muscular and ligamentous attachments of the bone give it no rest and so the injury can not heal. With every step, with every effort to sit down or rise, with every movement of the sphincter ani, the bone is pulled upon and moved. The torn fibers of the ligaments or the ruptured

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[1] "Med. Times and Gazette," July 2, 1859; the name is spelled in this issue "coccyodynia"; in the collection of Simpson's lectures edited by A R Simpson, the name appears as "coccygodynia"

[2] "Würzburg. med. Zeit," 1861, Bd ii.

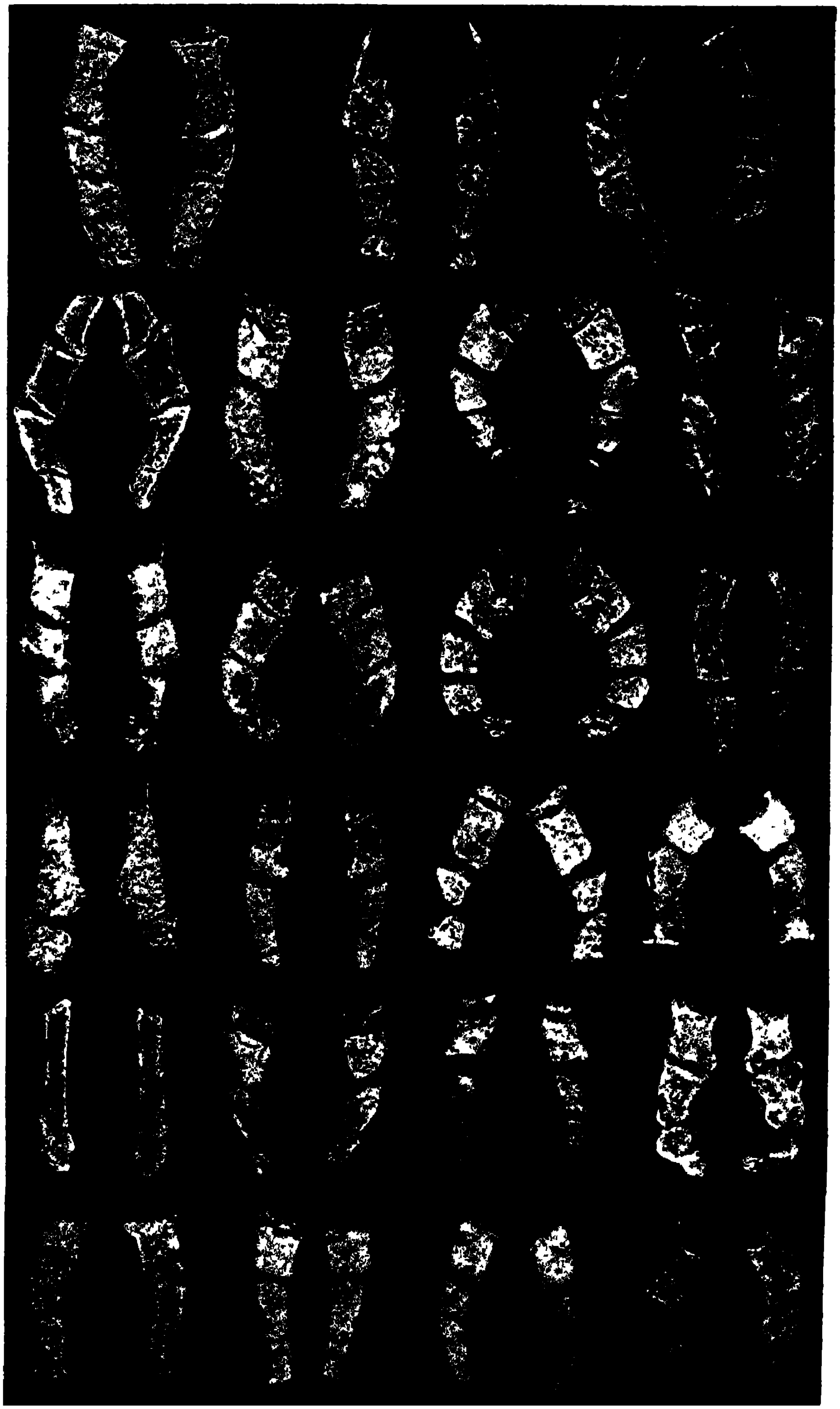

Fig. 147.—Types of injuries and disease of the coccygeal joints.

joints are thus constantly dragged apart and are never permitted to heal.

The explanation of coccygodynia in a woman who has not borne a child or met with an accident is more difficult and is not yet quite satisfactory. In cases of the kind under the author's observation there was abnormal mobility of the joint between the first and second coccygeal vertebræ, and a thickened, abnormally soft intervertebral disk between the bones. All the other joints, including the sacrococcygeal, were firmly ankylosed. This variety of coccygodynia occurs in women with ankylosis of all the coccygeal joints except that between the first and second bones, and probably some cause in them determines an abnormal movement of this single joint, perhaps hard work or exercise, possibly violence in coitus or the passage of large, firm masses of feces from the rectum Once the joints or its ligaments are overstretched, the sprain is never relieved, on account of the muscular and ligamentous pull upon the bones already described. A neurasthenic element or a nervous hyperesthesia may have to be considered in such cases, but it is not the main factor in the symptoms.

It is a common idea that coccygodynia is often an expression of rheumatism. This belief had its origin in Simpson's description of his first case. In the author's experience so-called rheumatic coccygodynia has almost always been due to injury of a joint

Following the discovery by Luschka of the coccygeal gland[1] there was a disposition to attribute the pain of coccygodynia to injury or disease of the gland to which "the nerve-supply is so rich that one is inclined to regard it as part of the nervous system" (Luschka) There is, however, no valid argument in favor of this view, and there is much against it

The pathological anatomy of specimens removed by operation may be thus summarized: In the majority of cases there is a rupture of a coccygeal joint or of the ligaments supporting it. The second coccygeal joint is more often affected than the first. In these cases the intervertebral disk of the injured joint is thickened and softened There may be a complete ankylosis of the whole bone, which runs in a straight line from the sacrum downward, so that whenever the patient sits down she feels as though she were sitting on a nail. There may be a softening and a hypertrophy of the intervertebral disk of the first joint, with relaxation or overstretching of the ligaments without a history of injury, and in one case there was an oblique fracture through the second coccygeal bone.[2] In cases of injured coccyges not operated upon because there are no symptoms, the bone has been fractured, or a joint has been ruptured, the lower fragment is pulled forward at right angles to the upper and is firmly ankylosed in this position. As there is no mobility there is no pain, but there would be serious difficulty in such a case in a subsequent labor.

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[1] "Die Steissdruse des Menschen," Hubert Luschka, "Virchow's Archiv," Bd xviii, Berlin, 1860.

[2] Described and illustrated in the writer's "Text-Book of Obstetrics."

Symptoms and Diagnosis.—The pain of coccygodynia is felt in "the very end of the spine," as the patient expresses it. The greatest pain is experienced in sitting down and rising from a sitting posture. In the former act the patient rotates her body on its long axis and lets the weight of her trunk fall upon one tuber ischii. When she rises she puts the palmar surface of one hand upon the seat of her chair and pushes herself up by her arm, so as to spare the gluteal muscles and those of the pelvic floor. There is pain in defecation and in coitus. Pressure over the coccyx also elicits pain If the coccyx is caught between the forefinger in the rectum and the thumb in the crease of the nates, the lower fragment below the ruptured joint may be thrown out of the line of the upper fragment (Fig. 148) At the same time the abnormal and the painful mobility of the bone may be demonstrated and the sharp ridge of the upper fragment may be felt when the lower fragment is pushed backward. It is impossible to do this with a normal bone.

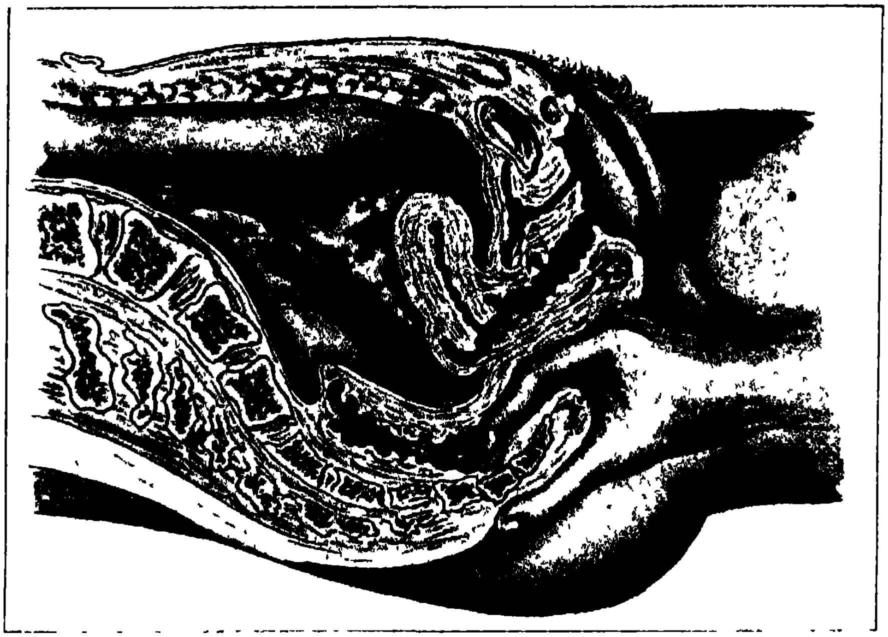

Fig 148.—Palpation of injured coccyx

In a very thin subject the displacement forward of the lower fragment leaves a sharp ridge of bone at the lower end of the upper fragment that irritates the skin over it, which is red, very sensitive, and from time to time acutely inflamed. There may be a constant distressing pain along the spinal column from the nape of the neck to the end of the spine.

Treatment.—The most satisfactory treatment of coccygodynia is coccygectomy Simpson, who advocated enthusiastically the subcutaneous severance of all the soft tissues attached to the coccyx, confessed that this operation had occasionally failed. If the injury to the bone occurs in labor, or is the result of a fall or a blow, it is justifiable to wait some months for a spontaneous recovery. There are a number of cases following labor in which the pain disappears after six months, so that length of time at least should elapse before resorting to operation, unless the patient's sufferings are too severe or have too serious an effect upon her nervous system Meanwhile counterirritants, as ung. iodi, and rest may be prescribed. If no disease or injury of the bones or joints can be demonstrated, the pain is hysterical or rheumatic, and should be treated accordingly.

The technic of coccygectomy may be thus described· The woman is placed in the Sims' posture. The skin over the coccyx is cleansed by the operator after the patient has been anesthetized A straight incision is made in the raphe from the top of the coccyx to the end of the sacrum, down to the bone The tissues are separated by retractors, and with a heavy scissors, sharp pointed and curved on the flat, all the soft structures are cut loose from the bone The forefinger of the left hand inserted under the bone acts as a guide and protects the rectum If there is ankylosis of the sacrococcygeal joint, it is difficult to tell when the top of the coccyx is reached, and the mistake is easily made of leaving a part of the coccyx behind The alæ of the first coccygeal bone are the best guides The dissection must extend above these points Into the cavity beneath the isolated coccyx a sponge or gauze pad is stuffed to catch fragments of bone or bonedust and to contrôl hemorrhage. A chain saw is slipped under the bone, and pushed up so that it takes off the tip of the sacrum Two or three to-and-fro movements sever the bone. The only vessel as a rule requiring ligation is the median sacral artery, which is tied with catgut A drain of five strands of silkworm-gut is laid in the rather deep wound, which is united with five or six interrupted silkworm-gut sutures The wound is scarcely distinguishable from the raphe after a few weeks. The result of the operation is usually most gratifying in the symptomatic relief afforded.

PART IV.

DISEASES AND INJURIES OF THE VAGINA.

The vagina is a canal with muscular walls, lined with mucous membrane, flattened from before backward so that the anterior and posterior walls are in contact. It is divided into three portions—the orifice or entrance, the body, and the vaults or fornix, into which the vaginal portion of the cervix projects, dividing the vault into the anterior, posterior, and two lateral vaults. The vagina runs a course upward and backward, its axis corresponding with the axis of the lower portion of the pelvic canal. It often presents a slight convexity forward on account of the anterior curvature of the rectum behind it. Its axis makes an angle with the horizon from behind of 65 to 70 degrees. In the middle of the lower portion of the canal, both on the anterior and posterior walls, there is a cord-like thickening, the anterior and posterior columns of the vagina. Running laterally from the columns there are well-marked rugæ in young women who have not borne children. On either side of the vaginal columns, running parallel with them, are quite deep clefts or sulci, so that a transverse section of the vagina has the shape of a letter H (Fig. 149). More than half the vaginal canal is below the level of the plane of the pelvic outlet. It has the following average dimensions:

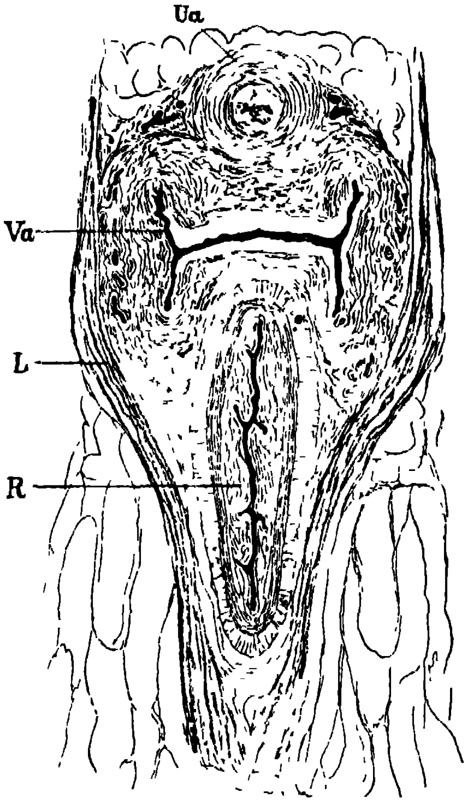

Fig. 149.—Section illustrating the characteristic form of the vaginal cleft. *Ua*, Urethra; *Va*, vagina; *L*, levator ani; *R*, rectum (Henle).

Length from orifice to external os uteri	7.0	cm
Length of the anterior vaginal wall	7.0	
Length of the posterior vaginal wall	8.22	
Breadth of the canal at its middle	2.5	
Depth of the anterior vault	3.5	
Depth of the posterior vault	1.75	
Thickness of vaginal wall	0.35	

The narrowest portion of the vaginal canal is its entrance, which is constricted by a voluntary ring muscle, the bulbocavernosus muscle, is narrowed by the bulbs of the vestibule, and encroached upon by the columns of the vagina and by the hymen in a virgin, or by its remnants, the carunculæ myrtiformes or hymenales, in a woman who has borne children. On

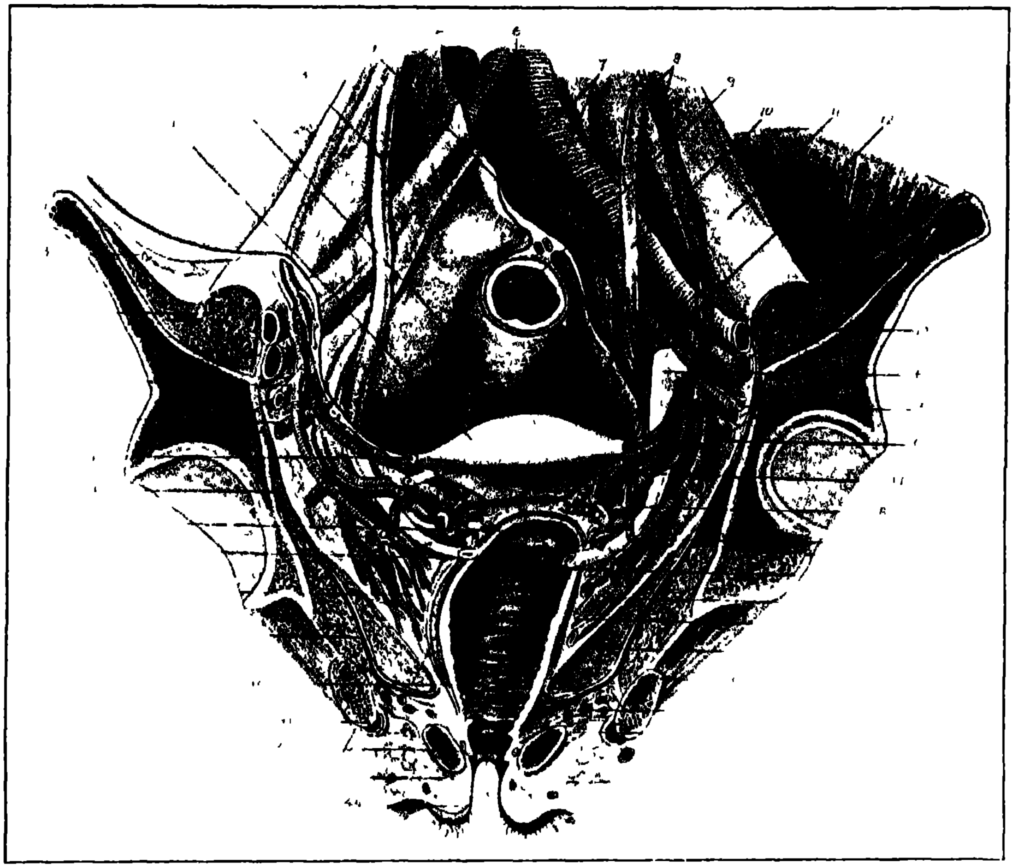

Fig. 150.—Frontal section of female pelvis: 1, Fundus uteri; 2, rectum, 3, right ureter, 4, peritoneum, 5, vena cava, 6, aorta, 7, left common iliac artery, 8, left internal spermatic vessels, 9, colon, 10, left ureter, 11, psoas muscle, 12, ureteric vein, 13, left external iliac vessels; 14, left ovary, 15, left obturator nerve, artery, and vein; 16, umbilical and vesical arteries, left; 17, left uterine artery, 18, uterovaginal plexus, left, 19, superior vesical vein, left, 20, orifice of left ureter, 21, vesicovaginal plexus; 22, left vaginal artery, 23, obturator internus muscle, with fascia, 24, resected os pubis, 25, urogenital trigonum muscle, vessels and nerve of the dorsum of the clitoris, 26, posterior labial vessels, 27, anastomotic branch of the obturator vein, 28, adipose tissue of the ischiorectal fossa, 29, vestibule of the vagina and carunculæ myrtiformes or hymenales, 30, lateral cutaneous femoral nerve, 31, femoral nerve, 32, right superior umbilical and vesical arteries, 33, obturator nerve and vessels, 34, resected Fallopian tube and round ligament; 35, parietal pelvic fascia; 36, vaginal portion of cervix, 37, orifice of right ureter; 38, right vaginal arteries; 39, obturator muscles and fascia, 40, posterior column of vagina and vaginal walls; 41, corpus cavernosum of the clitoris, ischiocavernosus muscle; 42, bulb of the vestibule and labium minus; 43, perineal fascia 44, labium majus (Waldeyer)

the inner surface of the anterior wall is a space marked by a transverse fold of mucous membrane 2.5–3 centimeters below the external os uteri and by two diverging lines beginning at the top of the anterior column of the vagina which corresponds with the trigonum of the bladder. Under the outer walls of the lateral vaginal vaults are sometimes found the remains of the Wolffian bodies—Gartner's ducts. The muscular coat of the vagina is divided into two layers, an outer of longitudinal fibers and an inner of circular fibers, the latter being the stronger. The mucous membrane is 1–1.5 millimeters thick, firm in consistency, being composed of squamous epithelium in well-marked layers. It is richly provided with elastic fibers and is studded with long papillæ. In its upper portion there are lymph-follicles. Glands have been found by a few observers, but they are most exceptional. Waldeyer has never seen them. There is no submucosa.

The arteries are, in the upper part, the cervicovaginal branch of the uterine artery; in the middle third, the inferior vesical artery; in the lower third, the median hemorrhoidal and the internal pudic.

The veins form a plexus between the mucous and muscular coats, the efferent vessels accompanying the arteries just named and emptying into the hypogastric vein. There is a complex network of lymphatic vessels under the mucous membrane, those in the lower third of the vagina emptying into the inguinal glands, those from the middle and upper third ending in the iliac and hypogastric glands.

The nerve-supply of the upper part of the vagina has the same source as the uterine nerves. The vaginal vaults and the vaginal portion of the cervix possess little sensitiveness as a rule. The pudic nerve supplies the lower portion of the vagina. The sympathetic nerve-fibers end in the unstriped muscle of the vagina and in the blood-vessel walls.

The vagina is supported and held in position by the muscles surrounding and inserted in it, and by its connective-tissue attachments to the bladder and urethra in front, to the rectum behind, and to the cervix above. The attachment to the bladder extends from the lower part of the fundus to the trigonum, becoming firmer from above downward. The connection with the urethra is most firm.

The attachment to the rectum is muscular and fibrinous, a few fibers of the levator ani muscle passing between the two and mingling with fibers of the internal sphincter ani and transversus perinei muscles; but the main bond between the two canals is connective tissue.

The muscles surrounding and inserted in the vagina are the levator ani muscle, the bulbocavernosus muscle, and the urogenital trigonum muscle. Intervening between the lower rectum and the vaginal entrance are the transversus perinei and the sphincter ani muscles

The levator ani muscle sweeps backward from its attachment to the anterior pelvic bones and ligaments in a horseshoe curve, passing alongside the vagina, though nowhere attached to it, encircling the rectum and sending some of its fibers between the rectum and the vagina, to be attached to the perineal fascia The muscle has a considerable breadth forming the segment of a funnel-shaped canal within its curve, slanting downward, inward, and forward. The contraction of this muscle pulls the rectum and perineum, and with them, indirectly, the vagina, forward and upward, contributing to the last-named the greatest part of the

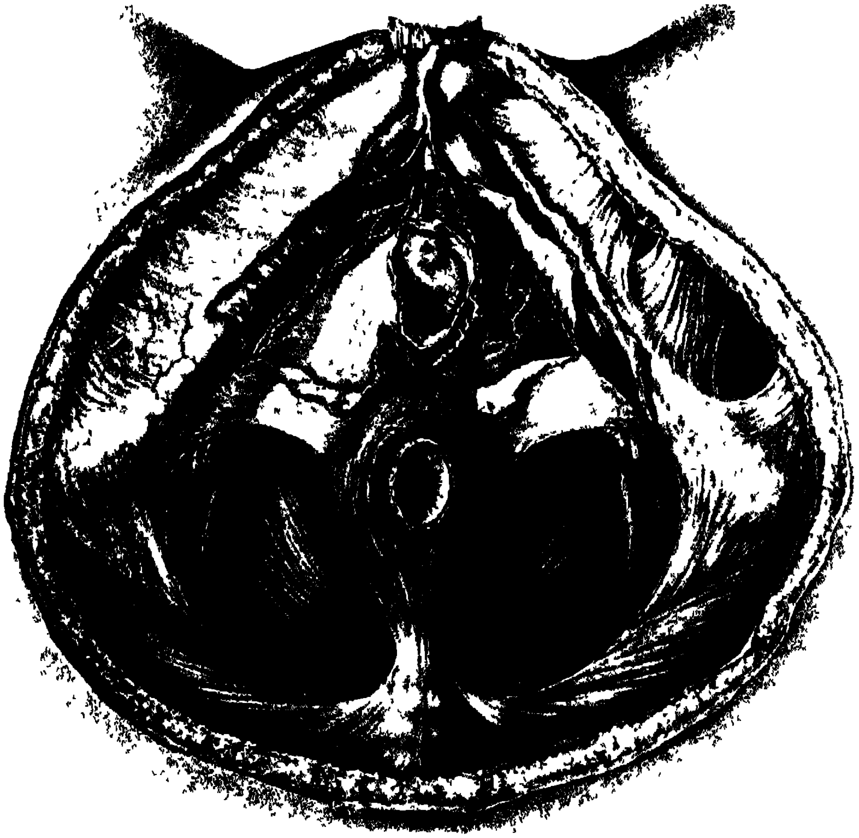

Fig 151 —The pelvic floor of the female pelvis from below, showing the sphincter and retractor ani muscles, the levator ani muscle, the pudic artery and the nerve of the dorsum of the clitoris on its outer side, the vulvovaginal gland, and the bulb of the vestibule (Deaver)

muscular and ligamentous support which holds it in the normal position.

The bulbocavernosus or constrictor vaginæ muscle in two symmetrical halves encircles the vagina, ending anteriorly at the crura clitoridis and posteriorly in the central aponeurosis of the perineum, mingling some of its fibers with the external sphincter

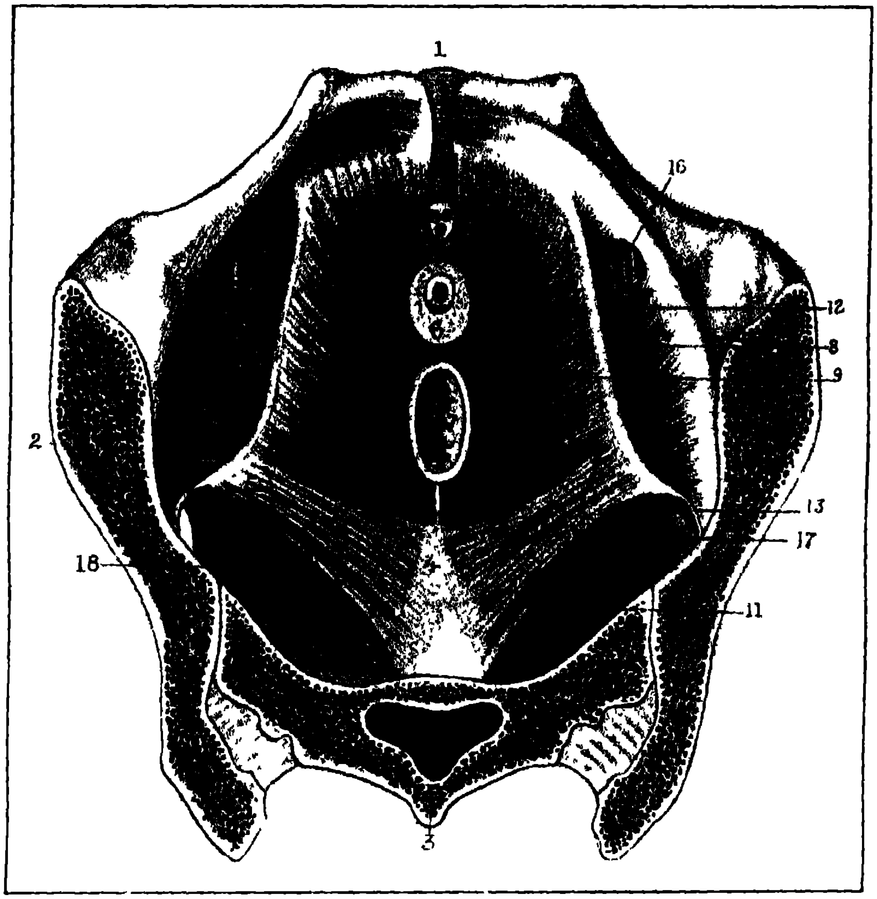

Fig 152 —Muscular diaphragm of the pelvis or pelvic floor, from above (male subject) · 1, Symphysis pubis; 2, iliac bone, resected, 3, sacrum, resected; 4, coccyx 5, ischiac spine, 6, prostate and urethra, 7, rectum, 8, internal obturator muscle; 9, levator ani muscle; 10, coccygeus muscle, 11, pyriformis muscle; 12, arcus tendineus of the levator ani muscle, 13, arcus suprapyriformis, 14, perineal center, 15, anococcygeal ligament, 16, obturator canal with its nerve and vessels, 17, suprapyriform foramen with superior gluteal artery, 18, posterior margin of the sacrosciatic ligament The dotted line indicates the pelvic outlet (Testut)

and the transversus perinei muscles. This muscle constricts the vaginal entrance from side to side and pulls it forward with the perineum. It also compresses the bulbs of the vestibule and the vulvovaginal glands

The muscle of the urogenital trigonum in two symmetrical halves arises from the ischiopubic synostosis, encircles the urethra, is inserted in the anterior and lateral walls of the vagina, and embraces it in part posteriorly. It furnishes a considerable portion of the support which holds the lower segment of the vaginal canal in position, especially the anterior wall. It also supports the urethra.

The transverse perineal muscle slung across the pelvic floor from the tuberosities of the ischia and united in the middle by the strong perineal aponeurosis gives support to the perineal body and so indirectly to the posterior vaginal wall.

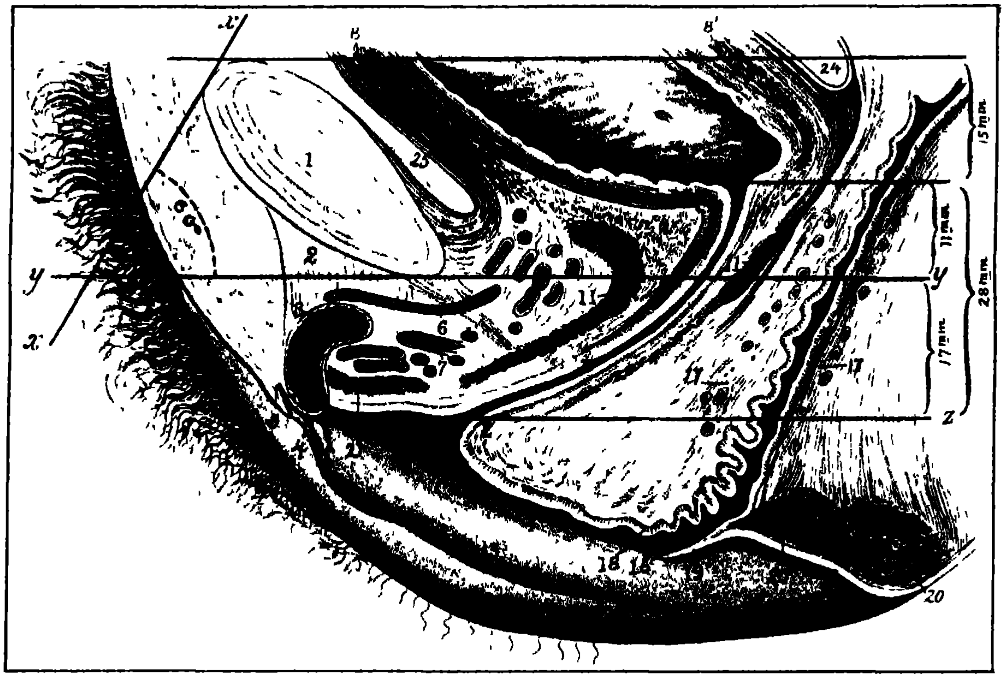

Fig. 153.—Median frozen section of pudendal region; virgin, twenty-four years old. 1, Symphysis pubis, 2, suspensory ligament of clitoris, 3, corpus cavernosum clitoridis; 4, glans clitoridis, 5, præputium clitoridis, 6, dorsal vein of the clitoris, 7, venous plexus communicating with the bulbus vestibuli and the clitoris, 8, 8′, walls of urinary bladder, 9, neck of the bladder, 10, urethra, 11, 11, external sphincter muscle of the urethra; 12, external meatus; 13, labium minus, 14, labium majus, 15, vestibule of the vagina, 16, vaginal entrance; 17, 17′, vaginal venous plexus; 18, carina urethralis, 19, hymen, 20, external sphincter ani muscle, 20′, 21 bulbocavernosus muscle; 22, fossa navicularis, 23, fourchet; 24, vesico uterine pouch; 25, prevesical space, x, x, plane of superior strait, y, y, horizontal line through lower edge of symphysis; z, z, horizontal line through external meatus, [illegible], horizontal line through top of symphysis; 9, horizontal line through internal meatus (Testut).

Between the lower rectum and the vagina is the perineal center, body or triangle, a mass of connective tissue and of unstriped muscle-fibers in which the muscles of the perineum and pelvic floor are inserted. Its shape contributes to the normal direction forward and outward of the lower third of the vagina.

Inflammation of the Vagina (Vaginitis; Colpitis).—Inflammations of the vaginal mucous membrane and of the submucous connective tissue are almost always due to infection. The commonest infecting agent is the gonococcus. Other causes of inflammation are the irritation and ulceration following the long retention of foreign bodies; atrophic changes in the mucous membrane, leading to ecchymoses; desquamation of epithelium and ulceration due to senile degeneration or to the deficient nutrition and the irritation of a prolapsed vagina; the ulcerations associated with dysentery, typhoid, and other infectious fevers or following the introduction of caustics, such as iodin, carbolic acid, chlorid of zinc; the irritating discharges of a cancer or myoma of the uterus and of a pelvic abscess. Infectious micro-organisms besides the gonococcus causing vaginitis are the bacilli of diphtheria, the streptococci of erysipelas, the pyogenic streptococci and staphylococci, tubercle bacilli, the bacillus aerogenes capsulatus and fungi identical with or allied to the thrush fungus, leptothrix, oidium albicans, monilia albicans, monilia candida, and yeast fungi

The manifestations of colpitis vary with the infecting agent, the cause of irritation and ulceration, and the stage of the disease. Granular colpitis is the commonest form. The vaginal mucous membrane is reddened and studded with papillæ, which are heaps of granulation-cells under the epithelium. There is a profuse discharge caused by a serous exudate, the exfoliation of epithelium, and the outwandering of small round-cells through the interstices of the epithelium. At first the discharge is mainly serous, but it quickly becomes a creamy pus, often with bubbles of gas in it. This is the type of inflammation seen in gonorrhea. With a profuse purulent discharge bathing the vulva and matting the pudendal hairs; a vulvitis, an infection of the urethra and of the ducts of the vulvovaginal glands, and the discovery of gonococci in the discharge, the diagnosis is positive In senile colpitis there are ecchymotic spots and perhaps actual ulceration, the intervening mucous membrane appearing healthy. A mycotic inflammation displays a moderate reddening of the mucous membrane, which is covered here and there, especially upon the vaginal portion of the cervix, with whitish plaques, sometimes easily removed, again not detachable without leaving a bleeding surface behind. Under the microscope the characteristic fungi are discovered in the substance removed. Streptococcic infection produces a yellowish-green pseudomembrane on the mucous surface; diphtheria bacilli, a dirty grayish membranous exudate. There is an exudative or desquamative colpitis (*colpitis gummosa*, Winckel) which is apparently not due to an infectious inflammation. It is sometimes associated with membranous dysmenorrhea, and occurs in neurotic women who are subject to that disease. An infection of the connective tissue around the vagina, *paracolpitis*, *dissecting colpitis*, may result in the exfoliation of part or all of the vaginal mucous membrane, leaving granulating surfaces behind, which are prone to unite, causing stenosis or even atresia of the vagina. The infection of the vaginal mucous membrane by the gas bacillus produces numerous vesicles in the vaginal mucous membrane (*colpohyperplasia cystica*, Winckel), from which the fluid which first fills them may disappear, being replaced by a gas (*colpitis emphysematosa*) demonstrated by Zweifel to be trimethylamin.

The treatment of colpitis varies with the causes and manifestations *Gonorrhea of the vagina* should be recognized at once, and should be treated with the utmost care and energy The patient's health and comfort in the future—nay, her very life—may depend upon the eradication of the specific infection before it has spread from the vagina to the uterine and tubal mucous membranes, whence it may never be dislodged except by radical operative treatment

Gonorrheal colpitis is most often seen in pregnant women. In non-pregnant adults the vaginal mucous membrane is so resistant that the specific infection is usually confined to the other mucous membranes of the genito-urinary tract In young girls and infants there may be an intense specific inflammation.

The patient with vaginal gonorrhea should be confined to bed. Her diet should be light, consisting mainly of milk; copious draughts of water should be drunk to produce a diuresis that shall frequently flush out the urethra. Twice a day the patient should be put in the dorsal position across the bed or on a table, her hips resting on a Kelly pad with a slop jar or bucket under it. The vulva is thoroughly cleansed with warm water, pledgets of cotton, and a small quantity of tincture of green soap, the light soap-suds being washed off with a permanganate of potassium solution (saturated solution, f℥j, to Oij water) poured over the vulva from a pitcher. The vagina is then douched with at least two quarts of a warm permanganate solution, the hand of the nurse or the physician being placed against the vulvar orifice from time to time in order to retain the fluid in the vagina, distend its canal, and so force the fluid into all the folds of the vaginal mucous membrane. After the douche, residual permanganate solution is washed out with a little sterile water, a skeleton bivalve speculum is inserted, and by this means a large pledget of absorbent cotton soaked in a 5 per cent argyrol solution is introduced. The speculum is withdrawn and the cotton allowed to remain five minutes. After its withdrawal a tampon of lamb's wool saturated with boroglycerid is inserted in the vagina by means of a bivalve or Sims' speculum and cotton forceps and is allowed to remain till the next treatment. For the boroglycerid, glycerole of tannin or tannic acid dusted on the tampon may be substituted. The vulva is then dusted with powdered boracic acid in all its folds, and a vulvar pad of sterile gauze and cotton, also dusted with boracic acid, is adjusted and retained by a T-binder.[1] If the patient is first seen after the inflammation has existed a considerable time, or if the treatment just described does not subdue the inflammation in a week, the vaginal mucous membrane should be bathed in a nitrate of silver solution, 20 grains to the ounce, which is most conveniently done by inserting a cylindrical milk-glass speculum until the cervix is engaged in its distal end and then pouring into it about an ounce of the silver solution As the speculum is slowly withdrawn successive folds of the vagina prolapse into its extremity and are bathed in the solution After the speculum is withdrawn a douche of plain water with a pinch of salt in it is given, to wash out the silver salt and to convert it into the insoluble chlorid. The patient's clothing should be raised well above her waist, as the silver solution stains everything with which it comes in contact If one or two of these applications on successive days, or forty-eight hours apart, do not remove the symptoms of vaginitis, the whole vaginal canal should be wiped out with glycerin and carbolic acid, equal parts, on a pledget of cotton through the skeleton speculum, the buttocks and labia being protected by petrolatum and a douche of water and alcohol, equal parts, being administered immediately afterward.

For a chronic vaginitis with profuse leukorrhea, and for the later stages of vaginal gonorrhea, an astringent and antiseptic douche of sulphate of zinc, ʒss, and powdered alum, ʒj, to the quart of water is useful. By the treatment described, vaginal gonorrhea rapidly disappears, leaving the mucous membrane perfectly healthy in appearance. But gonococci may lurk for years in the vulvovaginal glands, in Skene's glands of the urethra, in the uterine mucous membrane and especially in the cervical glands, where they are incited to renewed activity by any congestion of the pelvis or by any reduction in the vitality of the patient. Thus, there may be recurrent attacks of gonorrhea without fresh infection A wife infected by her husband and apparently cured has remfected him after his apparent cure, thus giving rise to a suspicion of her infidelity. A prostitute may infect only one of a number of men who cohabit with her, or may not infect any one for a time, but in consequence of a drunken debauch or a pelvic congestion from cold, suddenly becomes virulently infectious to all who come in contact with her. The treatment of chronic or recurrent gonorrhea, therefore, should usually include the slitting up of the ducts of the vulvovaginal glands and of Skene's glands, and their cauterization with pure carbolic acid, or disinfection by the injection of strong argyrol solution (10 to 50 per cent.), through a blunt hypodermic needle, a curettage of the uterus[1] and an application to its cavity of carbolic acid and glycerin, equal parts, and possibly amputation of the cervix.

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[1] Abraham advocates the insertion of vaginal suppositories composed of yeast, asparagin, and gelatin The favorable influence of yeast upon leukorrhea was known to Hippocrates The author has no experience with this treatment. "Monatsschr f. Geburtsh. u Gyn," Bd xvi, 1902.

Ulcerations of the vagina yield readily, as a rule, to localized applications of nitrate of silver solution, gr xx–f℥j, and the insertion of boroglycerid tampons, which not only allay congestion, but also prevent agglutination of raw surfaces. Senile vaginitis with an irritating serous leukorrhea responds in a most gratifying manner to vaginal suppositories with glycerin as a base, impregnated with the milder antiseptics, such as thymol, eucalyptol, etc. The suppository is inserted at bedtime, a napkin is worn through the night, as the suppository melts and thus gives rise to discharge. In the morning a boracic acid douche, ℥j to the quart, is taken

Colpohyperplasia cystica or colpitis emphysematosa is treated by puncturing the vesicles, which do not refill, and administering a boracic acid douche The disease usually appears in pregnant women, in whom local treatment, except in the last month of gestation, should, if possible, be avoided on account of the risk of inducing a miscarriage or premature labor. Streptococcic infection of the vaginal mucous membrane, with a yellowish-green pseudomembrane, does surprisingly well, as a rule, on daily irrigations with sterile water and general stimulation and support. Small localized infections may be treated by applications of a strong nitrate of silver solution. True diphtheritic membrane in the vagina should be touched with pure carbolic acid if the area involved is not too extensive, or with nitrate of silver solution, ʒi–f℥j, if the infection is widespread

Paravaginitis, *phlegmonous vaginitis*, or infectious inflammation of the perivaginal connective tissue, is treated on general surgical principles: early and extensive incisions into the inflamed areas, detachment of sloughs as soon as practicable, and vaginal packing or tampons to prevent agglutination of granulating surfaces During the sloughing period, when considerable masses of gangrenous vaginal mucous membrane may be retained in the vagina, gauze packing or wool tampons dusted with charcoal diminish the odor and lessen the chances of septic intoxication.

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[1] Curettage for gonorrheal endometritis is recommended with some reservation (page 359). It may be replaced by intra-uterine irrigation or applications of argyrol solution.

Tuberculosis of the vagina is rare on account of the resistance of the squamous epithelium of its mucous membrane to infection. When it does occur, it is, as a rule, the result of an infection from the uterus, so that the posterior vaginal vault is the usual site of the tubercular ulcer If the infection spreads from the vulva, the lower portion of the vagina is involved. Vaginal tuberculosis is ordinarily associated with tubercular inflammation in other portions of the genitalia, in the bladder, bowel, peritoneum, or distant organs, as the lungs, or a joint. There is, however, a case of primary tuberculosis of the vagina on record.[1] The sources of infection are discharges from the uterus, from a rectovaginal or a vesicovaginal fistula; the blood, infected hands or instrument; the male organ in coitus; infected clothing, or the atmosphere. The symptoms are pain in coitus or on the insertion of a syringe, and a vaginal leukorrhea, associated usually with the symptoms of tuberculosis elsewhere.

On inspection an ulcer is discovered, covered with a grayish, caseous exudate, with sharply defined borders, serpiginous in outline, surrounded by reddened infiltrated mucous membrane, in which miliary tubercles may be seen In later stages of the disease fistulous openings appear into the bowel, bladder, urethra, or perineum, or communicating with an infected tube. The differential diagnosis from cancer and syphilis is made by the discovery of tubercle bacilli in a bacteriological study and by inoculation experiments with guinea-pigs, in which tuberculosis is caused by injecting the tubercular material from the surface of the ulcer; by removing a small portion of the tissue around the edge of the ulcer, which shows under the microscope in cases of cancer the characteristic cell-proliferation, or in tuberculosis miliary tubercles; and in the case of syphilis by the therapeutic test

The **treatment** of vaginal tuberculosis is only palliative if it is associated with tuberculosis elsewhere, as is almost invariably the case. If the vaginal ulcer is the primary lesion, it may be excised, or cauterized by the actual cautery or by a 50 per cent. solution of chlorid of zinc.

Acquired Stenosis and Atresia of the Vagina.—By acquired stenosis is meant the narrowing of the vagina by cicatricial contraction. By acquired atresia is meant the obliteration of the canal by the agglutination of apposed granulating surfaces and by cicatricial contraction.

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[1] Carl Friedländer, "Lokale Tuberculose," 'Samml. klin. Vorträge," Volkmann, No. 64.

The **causes** of stenosis and atresia of the vagina are the injuries of labor and their injudicious repair; plastic operations with too extensive denudation and faulty insertion of sutures; the long retention of foreign bodies in the vagina and consequent ulceration, inflammations and ulcerations in childhood, adult life,[1] and old age; and the ulceration of the vaginal mucous membrane which follows the use of strong caustics, as chlorid of zinc applied to a cancer with insufficient precaution to protect the vagina, repeated applications of iodin, and even of nitric or sulphuric acid, which have actually been applied to the vagina to induce abortion.

The **symptoms** differ with the degree of contraction of the vagina, the age of the patient and her social state. In childhood complete atresia may occur after an ulceration of the vagina without attracting attention until menstruation begins In a single woman stenosis of the vagina may reach a marked degree without manifesting itself, as the first symptom would be dyspareunia, in old age, after the menopause, stenosis and even complete atresia may be discovered only by accident or not at all In married women stenosis of the vagina is a cause of dyspareunia, and it is on this account, most likely, that the patient seeks medical aid. But the author has seen a case of stenosis of the vagina by which the canal was reduced in its whole length to a sinus not admitting a uterine sound, the contraction had been the result of injury in a labor eighteen months before; coitus had been practised frequently, and the condition was only discovered in a pregnancy at term In some of these cases coitus takes place by the urethra, which is gradually dilated to a sufficient extent to admit the male organ, and, strangely enough, without incontinence of urine as a result Impregnation has thus occurred by way of a vesicovaginal fistula. On inspection and digital examination of a case of acquired stenosis the vagina is found obstructed by connective-tissue bands or membranes stretched across the canal, or by cicatricial bands and infiltration encircling the vagina or running longitudinally under the mucous membrane The obstruction may be confined to a limited area or may extend the whole length of the canal. It is usually possible to insert at least the tip of the forefinger through the narrowed canal, but the vagina may be contracted to a mere sinus scarcely admitting a surgeon's probe.

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[1] Brose ("Zeitschr f Geburtsh. u Gyn," Bd. xxiv) reports the extrusion of a gangrenous piece of vaginal mucous membrane five days after the crisis of a croupous pneumonia.

Atresia of the vagina manifests itself after puberty by a retention of the mucosanguinolent discharges of the genital tract The patient experiences and exhibits the menstrual molimina without a bloody discharge. Pain in the hypogastrium appears, aggravated at the menstrual periods ; a tumor slowly develops in the lower abdomen, increasing in size at the periods and decreasing somewhat in the intervals, but growing larger from month to month ; coitus, if attempted, is found impossible or unsatisfactory. On examination, the obliteration of the vaginal canal is easily detected. If the closure begins near or at the orifice, a separation of the labia discloses it If it is situated higher, the vagina ends as a blind pouch, usually in its upper third. If the agglutination of the vaginal walls is confined to a limited area, a bulging membrane is seen and felt, behind which the accumulation of menstrual blood may easily be appreciated as a cystic tumor. If a considerable length of the vagina is obliterated, a recto-abdominal examination is required to detect the extent of the atresia and the accumulation of retained fluid above it. In this examination account should invariably be taken of the tubal condition. There is usually hematosalpinx, which may be unilateral It is also desirable to determine the approximate quantity of retained blood by the size of the tumor, the involvement of the uterus in the distention of the genital canal (hemelythrometra) and the thickness of the cicatricial tissue between the bladder and rectum, which is estimated by a sound in the bladder and a finger in the rectum.

The **treatment of stenosis** has for its object the dilatation of the canal. This is accomplished in various ways Gradual dilatation with bougies may suffice, but the treatment must be continued persistently a long time and may not lead to a permanent cure. Fibromyxomatous bands and membranes stretched across the vagina should be excised Usually there is no occasion for hemostasis, but it is advisable to draw the mucous membrane over the wounded surfaces by interrupted sutures of catgut. Cicatricial bands under the mucous membrane should be incised as deeply as possible wherever they are felt to be most tense. They may be torn by the finger even more deeply than they can safely be cut. The mucous membrane alone is united over the wounds with interrupted sutures introduced in a direction parallel with the cut, so as further to enlarge and not to contract the vagina. A vaginal plug (Sims') of glass, hard rubber, or metal should then be inserted, and should be retained continuously for a month, being removed daily to be cleansed and to allow irrigation of the vagina. The plug should be worn for a few hours daily during the year succeeding the operation, being retained by a napkin or by a special apparatus which the author has employed with satisfaction (Fig. 79).

If the stenosis extends the whole length of the vagina and is extreme in degree, the success of any treatment is problematical If the patient comes under the physician's observation when she is pregnant, a Porro Cesarean section is required at term. After the removal of the uterus the stenosis of the vagina requires no treatment.

The **treatment of atresia** has for its object the restoration of the caliber of the vagina and the restitution of an external outlet for the discharges of the genital tract The same principles obtain in the treatment of congenital and acquired atresia, but the latter is often more difficult to deal with The condition of the tubes should receive the first attention If there is hematosalpinx, the tubal sac should be removed by an abdominal section before the vagina is opened and the blood in the uterus and vagina is evacuated The numerous deaths after operations for atresia have been due to tubal infection or rupture and a consequent peritonitis.

To open the occluded vaginal canal it may be sufficient to make a crucial incision in a membranous septum or to excise it at its base. The retained blood, as thick sometimes as tar, flows out slowly and should be thoroughly washed away by a boracic acid solution. The wounded surface encircling the vagina, if the membrane is excised, is covered with mucous membrane by inserting interrupted sutures from above downward, uniting the mucous membranes of the healthy portions of the vagina If the atresia involves a considerable length of the vagina, a blunt dissection is required between the bladder and rectum, with a sound in one and the forefinger of the left hand or a bougie in the other, the tissues being separated by the blunt end of a closed scissors, the occasional stroke of a knife, and the operator's fingers. When the accumulated fluid is reached and evacuated, the opening which has been secured by a blunt dissection should be enlarged as much as possible by graduated bougies, the fingers, or powerful branched dilators, the force being applied laterally so as to avoid injury to the bladder or rectum. The problem is now to prevent a reclosure of the canal. This has been accomplished in several ways The prolonged retention of a plug with the idea that the caliber of the vagina shall be maintained while a proliferation and extension of the vulvar epithelium finally covers the raw surfaces with a new mucous membrane; the implantation of flaps gained by cutting loose the labia minora except at their bases, splitting them longitudinally, joining them together, suturing their edges, and inverting them into the vagina, where they are sewed fast (Kustner); implanting a tube of vaginal mucous membrane obtained from a prolapsed vagina in another patient, as has been successfully done by Mackenrodt and by the author;[1] implanting intestinal mucous membrane secured by resection of the bowel in another patient (Kustner). In these latter methods some plan must be adopted to keep the vagina distended and the transplanted flaps or implanted membrane in close apposition with the raw surfaces A tampon left undisturbed for a number of days and a vaginal plug have been employed for this purpose, but there are objections to both plans. Noble's suggestion to insert a pouch of thin rubber tissue and to distend it with gauze packing is a good one. When the newly made vagina is clothed with mucous membrane by any one of the methods just described, systematic attempts to retain a sufficient caliber in the canal should be begun about three weeks after the operation, either by regular daily dilatation with a bougie or by the use of the vaginal plug, worn daily for at least an hour Occasionally the most satisfactory operation for atresia is hysterectomy. In a case under the author's care a LeFort's operation on the vagina had been performed by another operator three years before; on examination a row of silver sutures was found extending across the vagina, where they had been for three years. There was complete atresia, with extremely firm cicatricial contraction, a pyelythrometra, which had ruptured into the bladder, an extensive vesicovaginal fistula above the site of atresia, double pyosalpinx, and a general septic intoxication The patient was cured by a hysterectomy and the removal of the uterine appendages With no further discharge into the upper vagina the vesicovaginal fistula closed spontaneously. The atresia was not corrected, as the only purpose of such treatment would have been to establish a coitional vagina, which experience has shown to be impracticable in the absence of the uterus Even were permanent success assured, the propriety of medical treatment to that end is questionable.

Injuries of the Vagina and of the Pelvic Floor.—The vagina may be injured in coitus, especially if it has undergone senile atrophy and contraction, or is superinvoluted, as it may be during lactation. The vaginal vaults have thus been penetrated and the posterior fornix has been torn away from the cervix. Injury has been inflicted by the indulgence of perverted sexual instincts. In one case a drunken brute inserted his whole hand in the vagina and tore out the woman's womb. Falls upon pitchforks and broom handles or similar articles have resulted in penetrating wounds, and instruments inserted by unskilled hands to induce abortion have perforated the vaginal walls. The forcible insertion of too large a pessary has lacerated the vaginal entrance. Wounds of the vagina usually bleed profusely. The hemorrhage, however, can be controlled by sutures or by gauze packing. If a penetrating wound of the vault opens the peritoneal cavity, cleanliness and drainage often secure a favorable result. The latter is provided by the use of gauze packing and a double rubber drainage-tube. After four or five days the pelvic cavity, shut off by that time by adhesive inflammation from the rest of the peritoneal cavity, may be irrigated with sterile water daily until all discharge ceases and the water returns clear. If intestines prolapse through the vaginal wound, they should be cleansed by pouring sterile water over them, and should be returned into the pelvic cavity, where they are held by gauze packing. A long loop of intestine prolapsed into the vagina has become gangrenous by strangulation at the point of emergence through the wound. The gangrenous portion may be excised and an intestinal anastomosis performed, if necessary, by enlarging the vaginal wound, when the gut should be returned to its proper place and retained there by packing the lower pelvic canal and the open wound with a long strip of gauze.

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[1] In the author's case a woman with total prolapse was operated upon first; two broad strips of mucous membrane were excised, sewed together with catgut around a cylindrical speculum, and placed in a warm normal salt solution A rapid blunt dissection was then performed in the patient with atresia to a depth of three inches. The vaginal mucous membrane on the speculum was implanted, the latter withdrawn after being filled with iodoform gauze which remained in the vagina undisturbed for two weeks

The most frequent injuries of the vagina by far occur during labor. They include rents in the vaginal vault, usually extending from the cervix, cuts from the edges of a forceps, lacerations of the mucous membrane by overdistention of the canal as the fetal head passes through it, and by the insertion of a physician's whole hand. Associated with tears of the vaginal mucous membrane or without visible injury to its walls there are often two forms of injury in labor that seriously affect the woman's subsequent health and comfort. One of these injuries is the stripping of the vaginal walls from their subjacent attachments to fascia and muscle. The fetal head in its descent pushes the vaginal walls in front of it as a glacier forms its morraine, tearing the walls of the canal loose so that they have a tendency later, when the woman stands erect, to sag down and finally become inverted, prolapsing from the vulvar orifice. This glacier-like action is most commonly seen upon the anterior vaginal wall, which is nipped between the fetal head and the maternal symphysis, thrown into prominent transverse folds, and forcibly pushed downward in front of the presenting part until it is torn loose from its attachment to the fibromuscular structures that unite it with the bladder and urethra, and which furnish a considerable proportion of the support necessary to keep both the anterior vaginal wall and the bladder in their normal positions. In addition to this form of injury there is often a laceration of the fibers of the urogenital trigonum muscle in the anterior vaginal sulci. The result is a prolapse of the anterior vaginal wall, the formation of a pouch anteriorly into which the bladder naturally falls by gravity. A vicious circle is then established. The more the vaginal wall descends, the deeper the bladder sinks; the farther the bladder descends, the lower it pushes in front of it the anterior vaginal wall, until both emerge from the vulvar orifice, constituting a projecting tumor called a cystocele. This condition is all the more likely to develop if the structures behind the vagina and in the perineum are injured, robbing the anterior wall and the bladder of the support naturally afforded them by the muscular and ligamentous tissues encircling the vagina posteriorly and holding the whole canal in its proper position. But a cystocele may develop with little or no appreciable injury to the posterior vaginal wall, pelvic floor, or perineum, except an overstretching and relaxation. The patient with a cystocele experiences difficulty in urination, and has the sensation of never completely emptying the bladder, which indeed she cannot do, as the fundus is at a lower level than the neck. No sooner, therefore, does she urinate than she has the inclination to pass water again. To add to her discomfort, the residual urine in the bladder decomposes, causes a chronic cystitis, and in time perhaps a ureteritis and a pyelitis.

Very rarely the glacier-like action described affects the posterior vaginal wall; but owing to the smooth surface of the latter when the vagina is distended in labor, its firm attachments to the subjacent fascia and muscles, the absence of transverse rugæ, and of a *point d'appui* against which it can be caught by the descending head, a detachment of the posterior wall is very rare indeed, although it can and does occur. The other, the most frequent and most important injury of labor, is a laceration of the muscles and tendinous structures of the pelvic floor and of the perineum—the levator ani, the transversus perinei muscles, and the perineal body. As the fetal head descends in labor, the levator ani muscle and to a less extent the transversus perinei impose upon the presenting part the new direction forward and upward which it must take to escape under the pubic arch and through the vulvar orifice. In the course of this action the sloping surface of the frontal portion of the cranium displaces the muscles backward until they both describe a loop posteriorly around the greatest circumference of the fetal head at the moment of its expulsion Thus they are relieved of a great part of the strain that is at first imposed upon them, and would continue to an increasing degree if they maintained their original position in relation to the perineum. If anything interferes with the backward displacement of these muscles, as a persistent occipitoposterior position, in which the shape of the occiput is not calculated to push backward gently and gradually the muscular structure of the pelvic floor; if time is not allowed for the gradual displacement and stretching of the muscles, as in a precipitate labor, if, even when the muscles are normally and slowly displaced, they are

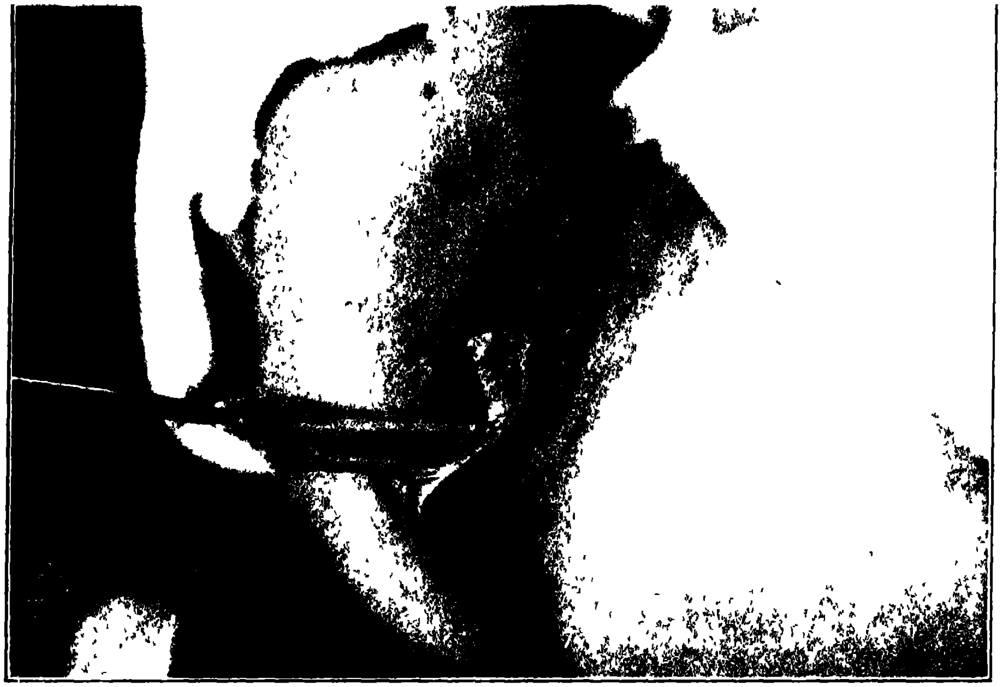

Fig. 154.—Prolapse of posterior wall of vagina with uterus at normal level.

put on too great a strain by a disproportionate size of the fetal head, they tear in the direction of least resistance and in the place where they feel the greatest strain: the levator ani muscle in one or both posterior vaginal sulci because the muscular support is weaker at these points than in the median line, and because the head is oblique during the time this muscle is subjected to greatest strain, the transversus perinei and perineal body usually in the median line, because the head when it meets this muscle is directed with its longest diameter anteroposteriorly, and the strain is greatest in the median line. The subsequent results, if the injury is not repaired immediately, depend upon the muscle involved in the tear. If the transversus perinei and perineal body alone are lacerated, the vulvar cleft is lengthened, perhaps to the sphincter ani. The tear may encircle the latter muscle partially or even completely without involving its fibers. But the division of the external perineum causes the woman no great discomfort. The vaginal walls maintain their normal position and the canal its normal caliber after childbirth. The vulvar orifice may gape, and as a result of such a movement as turning in bed, air may enter the vagina and then may be forcibly and audibly expelled (*garrulity of the vulva*); the exposure of the mucous membrane of the vaginal entrance may cause an irritation and consequent vaginal leukorrhea, and the enlargement of the vulvar orifice may be a cause of subsequent sterility by permitting the escape of seminal fluid immediately after coitus ; but aside from these disadvantages which may not attract the woman's attention, she experiences no discomfort or disability. If the levator ani muscle is torn, the result is much more serious The posterior vaginal wall is deprived of the support which holds it up and pulls it forward. It drops back in the supine position, and instead of resting against the anterior wall as it should, the two are widely separated. The anus also drops back and is pulled backward by the retractor ani muscle, elongating the skin perineum The vaginal canal runs a course not forward and outward, but more directly downward as the woman stands erect The posterior vaginal wall, no longer pulled forward and firmly supported by the levator ani muscle, sags downward in the erect posture, making a pouch into which protrudes the anterior rectal wall, not separated from the vagina by the muscular, fibrinous, and elastic tissues which normally intervene between the two, but in immediate contact with the vaginal wall. This displacement of the anterior rectal wall with the backward displacement of the anus gives to the lower rectum an anomalous sigmoid course, making the expulsion of feces mechanically difficult. Chronic constipation results, with accumulation of large fecal masses in the rectal pouch behind the vagina, pushing the latter farther downward and outward until the posterior vaginal wall with the anterior rectal wall protrudes as a tumor, called a *rectocele*, from the vulvar orifice The prolapse of the vagina drags upon the cervix and the bases of the broad ligaments, predisposing to retroversion of the uterus, to prolapsus uteri, and to engorgement of the pelvic veins. The chronic engorgement of the latter leads to a congestion and an interstitial hyperplasia of the pelvic viscera, especially the uterus, which is further congested by its malposition Hence metritis and endometritis are a consequence in time of a laceration of the levator ani muscle. The hemorrhoidal veins are overdistended by the obstructed pelvic circulation, and hemorrhoids are an almost constant accompaniment of extensive injury to the pelvic floor.

In a laceration of the vaginal sulci or of the perineum, if the tearing force is violent or suddenly exerted, the tear may extend through the sphincter ani and through the rectovaginal septum to a varying height, sometimes more than two inches. If the rectal tear is an extension from a laceration of one vaginal sulcus, as it usually is, the injury of the sphincter and of the septum is always on one side of the median line, if the laceration begins in the perineum, it may extend directly backward in the median line through the sphincter. The result of a complete laceration of the perineum through the sphincter is usually incontinence of feces and gas. The woman is unfit for company and may be-

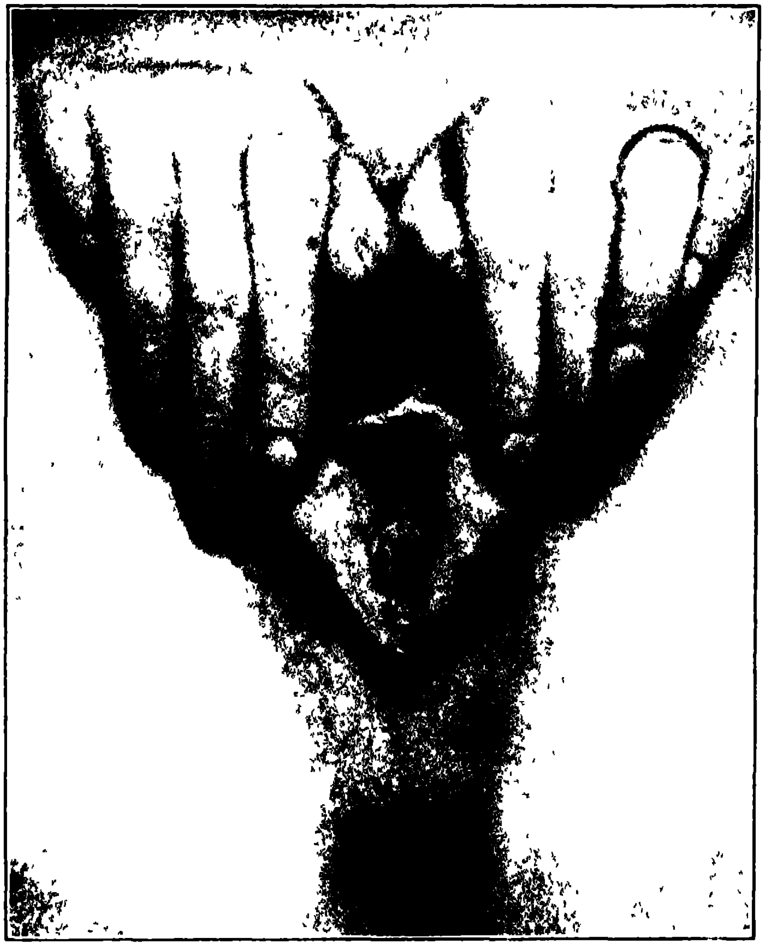

Fig. 155 —Normal and remarkably well preserved vulvar orifice, vaginal introitus, and pelvic floor in a primipara six weeks after labor

come repulsive to her husband. She grows melancholic or develops a varied train of reflex neuroses. Occasionally, however, complete continence is maintained in spite of a tear through the sphincter extending two inches up the rectovaginal septum, and the woman may be so comfortable that she refuses treatment. Such a patient probably acquires the ability of controlling her bowels by the approximation of the gluteal muscles.

Finally, there may be what is called a central tear of the perineum, the fetus passing from the birth-canal through a perforation of the perineum and not through the vulvar orifice. Such an injury, if it is not repaired immediately or does not close spontaneously, leaves a perineovaginal fistula.

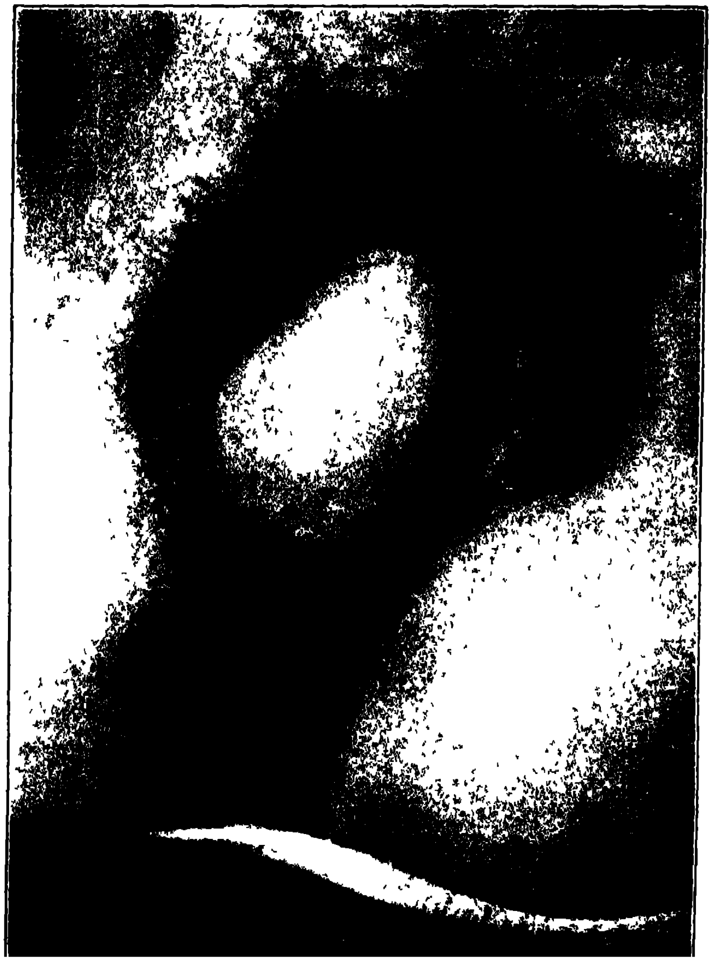

Fig 156.—Cystocele.

The **diagnosis** of the various kinds and degrees of lacerations of the pelvic floor is made by inspection and by a digital examination. The woman is placed in the dorsal gynecological position for a vaginal examination. To recognize a tear of the external perineum and of the transversus perinei muscle, the labia are pulled apart by the thumbs. The cleft through the perineum is at once disclosed and its degree is evident. To determine the existence of an injury to the anterior vaginal wall, stripping it off from its subjacent attachments, the woman is asked to cough or to strain and bear down, when the anterior vaginal wall and the posterior wall of the bladder protrude from the vulva. If there is any doubt as to the nature of the tumor, a sound in the bladder solves it. The tip of the instrument is felt directly beneath the vaginal mucous membrane covering the cystocele

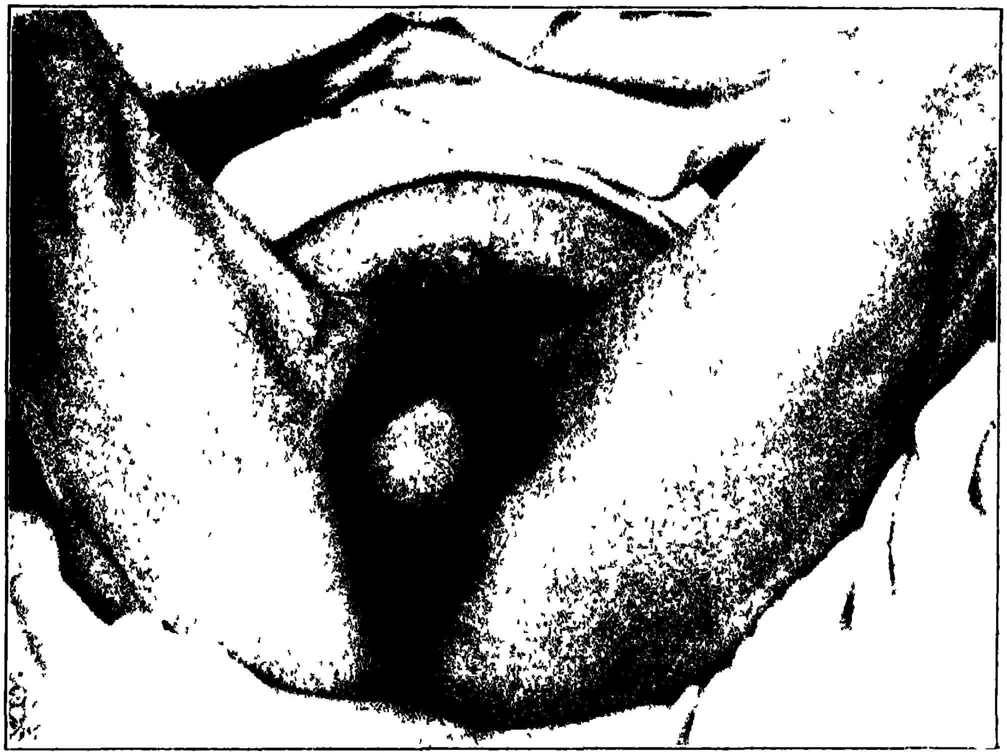

Fig 157 —Cystocele associated with large intraligamentary ovarian cyst

In a suburethral abscess, the only condition which simulates a cystocele, the sound in the bladder is separated a considerable distance from the palpating finger, there are the local and general signs of suppuration, and pus exudes from the ducts of the urethral glands when the abscess is subjected to pressure. Injury of the urogenital trigonum muscle is recognized by the lower anterior vaginal wall and urethra dropping backward in the supine position and protruding from the vaginal entrance; also by pressing the palmar surface of a forefinger upward in each anterior sulcus If the muscle is uninjured, a muscular cushion is felt between the finger and the bone; if it is injured, the finger feels the sharp lower edge of the pubic bone with nothing intervening except thin mucous membrane.

The diagnosis of injury to the posterior vaginal sulci and the levator ani muscle is made by several tests. The forefinger is inserted in the vagina to its second joint, and pressure is made downward and outward toward each tuber ischii. It sinks in a deep cleft and may reach the pelvic bones without much resistance. The finger is swept around the posterior wall of the vagina from one descending ramus of the pubis to the other. On one or both sides of the median line it sinks into a deep depression and notes the absence of the circular sweep of a strong muscular band that is felt in the normal vagina. Both fingers are inserted in the vagina and are depressed toward the tuberosities of the ischia; the vagina gapes to an astonishing degree as the posterior vaginal wall is separated widely from the anterior. The levator ani muscle is palpated between the forefinger in the vagina and the thumb externally. The thickness of the muscle and its integrity or injury are appreciated plainly. A finger in the rectum making pressure forward and outward recognizes the pouch in the anterior rectal wall, everts the posterior vaginal wall through the vulvar

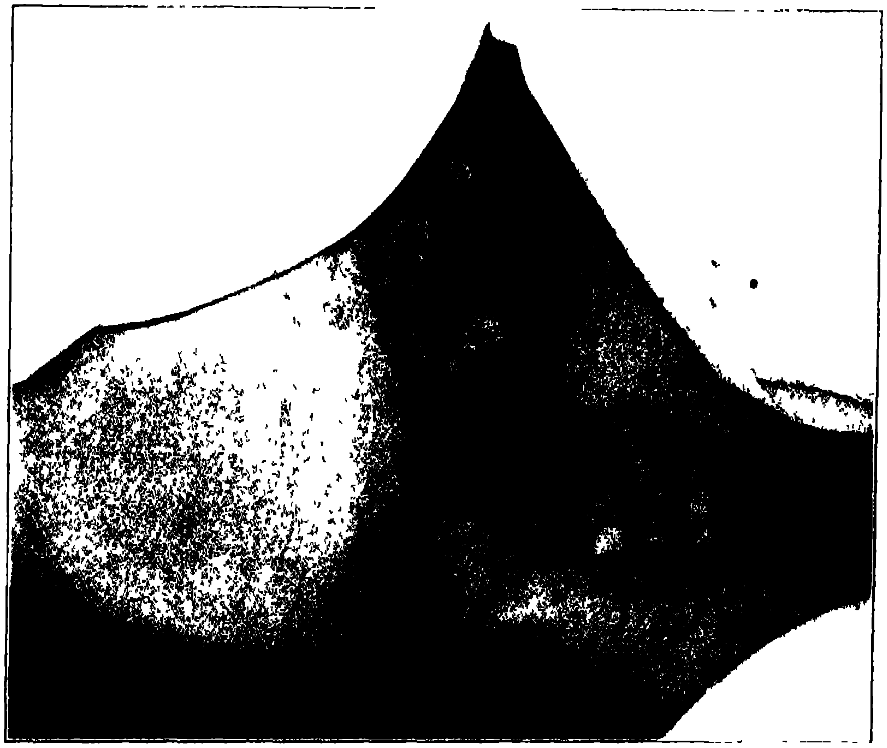
Fig. 158.—Everting the posterior vaginal wall by a forefinger in the rectum.

orifice, detects the absence of the firm perineal body or triangle, and appreciates the tenuity of the mere skin perineum which intervenes between the posterior commissure of the vulva and the anus. A forefinger in the rectum and the thumb in the vagina demonstrate plainly the absence of the perineal triangle and the close approximation of rectal and vaginal walls. When the woman bears down, the posterior vaginal wall, and with it the anterior rectal wall, rolls out of the vulvar orifice; the rectocele is evident On inspection of the external parts the elongation of the perineum is seen, the anus being nearer the coccyx than it should be, and the skin of the perineum is evidently relaxed. Penrose calls attention to an interesting test of the integrity of the muscles of the pelvic floor. If in an uninjured woman the perineum or a labium is pricked with a pin, the bulbocavernosus and the levator ani muscles respond to the irritation by a strong reflex contraction drawing the anus and the vulvar orifice nearer to the symphysis. If the levator ani muscle is lacerated, there is no response to external irritation and no power of voluntary contraction; the perineum remains flabby and relaxed; the position of the anus is unaltered. The woman gives the history that she cannot stand long erect or make much effort in the erect posture without backache, a feeling of weight, bear-

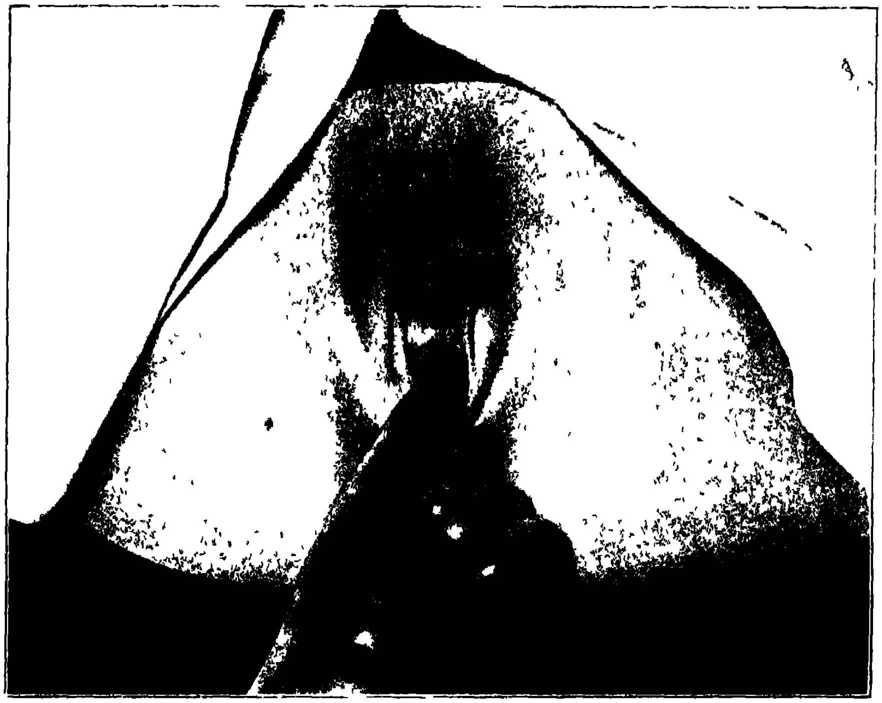

Fig. 159.—Testing the thickness of the rectovaginal septum by the forefinger in the rectum and the thumb in the vagina.

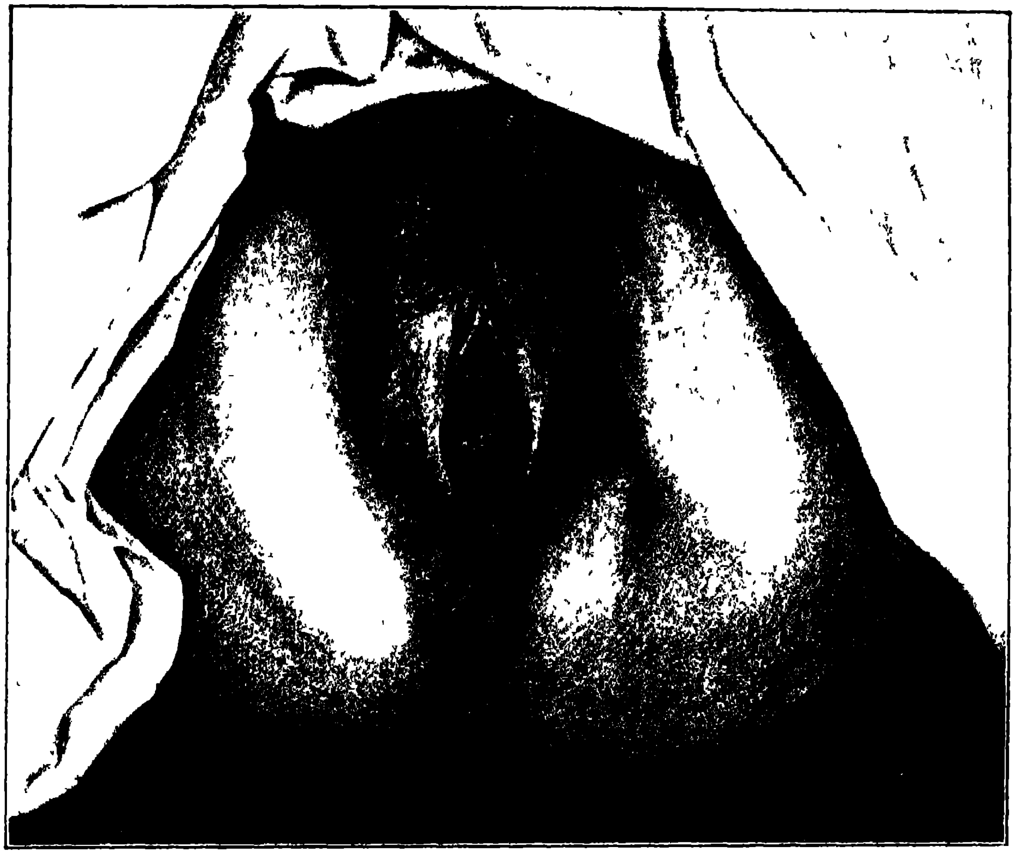

Fig. 160.—Rectocele of moderate dimensions

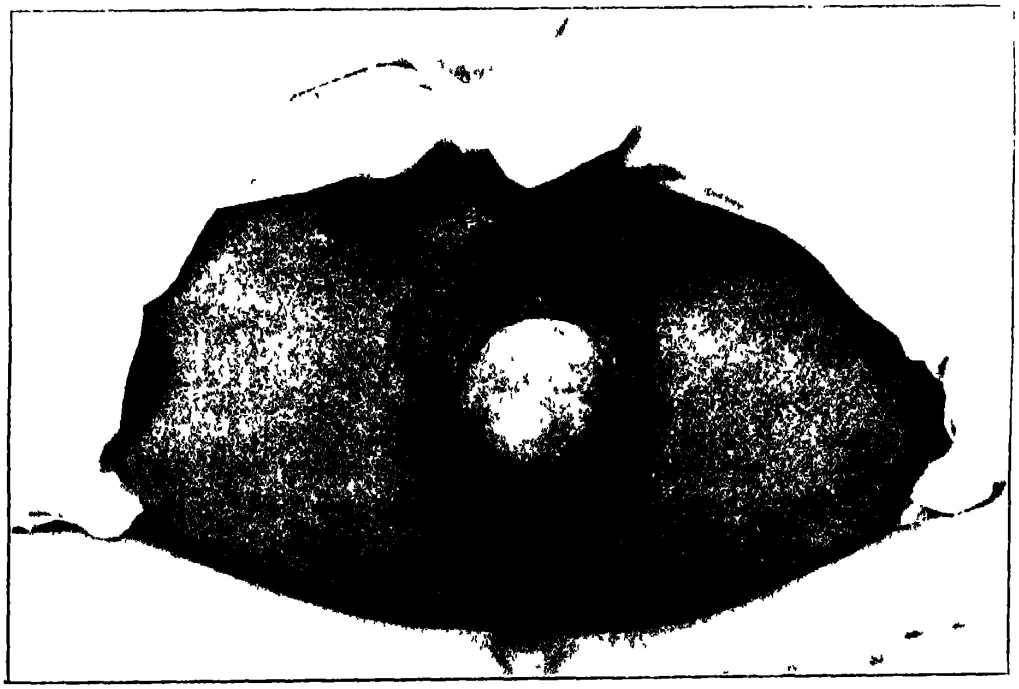

Fig 161.—Rectocele of unusual dimensions

ing down, and a protrusion from the vulva, which is usually called by the patient her womb. There is difficulty in defecation, which the woman often learns to obviate in part by pressing back the rectocele with her hand as she defecates There is frequently a pain on the top of the head or in the nape of the neck. The general health deteriorates and the nervous system displays many symptoms of irritation and exhaustion, even to melancholia with a suicidal tendency.

The diagnosis of a complete tear of the perineum through the sphincter ani should always be made with comparative ease in a careful examination, but the condition is not infrequently overlooked and therefore uncorrected. Suits for malpractice are frequently based on this ground.[1] There is almost always, but not invariably, a history of incontinence of gas and feces, at least when the bowels are loose. With the woman in the dorsal position, stretching the labia apart displays the tear into the rectum and exposes the rectal mucous membrane. The retracted sphincter ani may be observed lying in almost a straight line across the posterior margin of what had been the anus, and two well-marked dimples often indicate the position of its ends. The skin over the sphincter posteriorly is thrown into exaggerated folds, which are not so plainly marked laterally, and of course are entirely lacking anteriorly. A forefinger in the rectum and the thumb in the

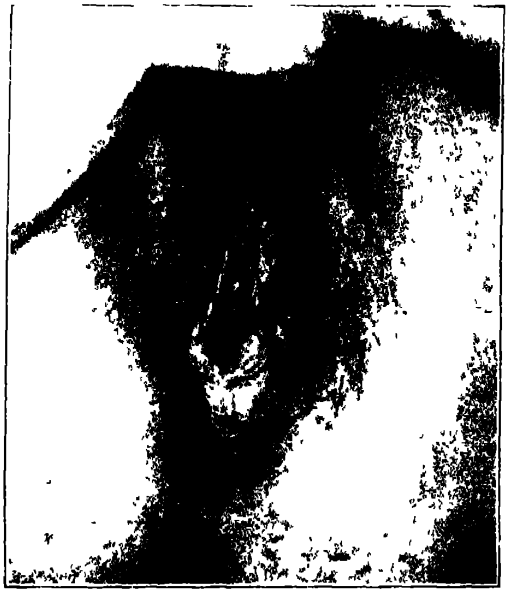

Fig 162 --Multipara; gaping vulvar orifice with rectocele and cystocele.

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[1] The author figured as an expert witness in three such suits in a single year.

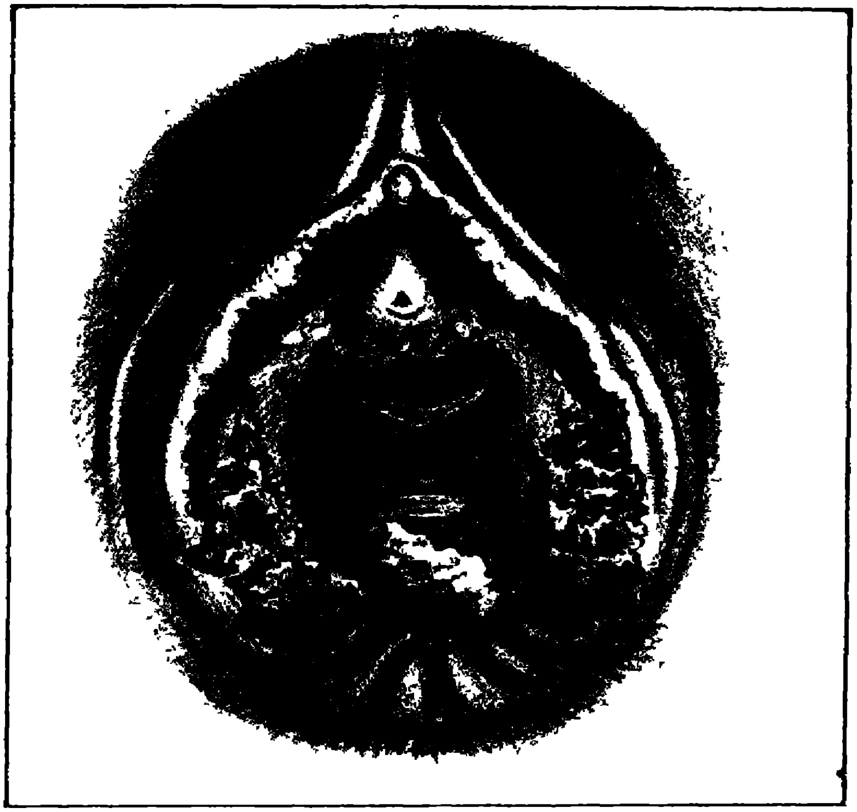

Fig. 163.—Complete tear of perineum shortly after labor

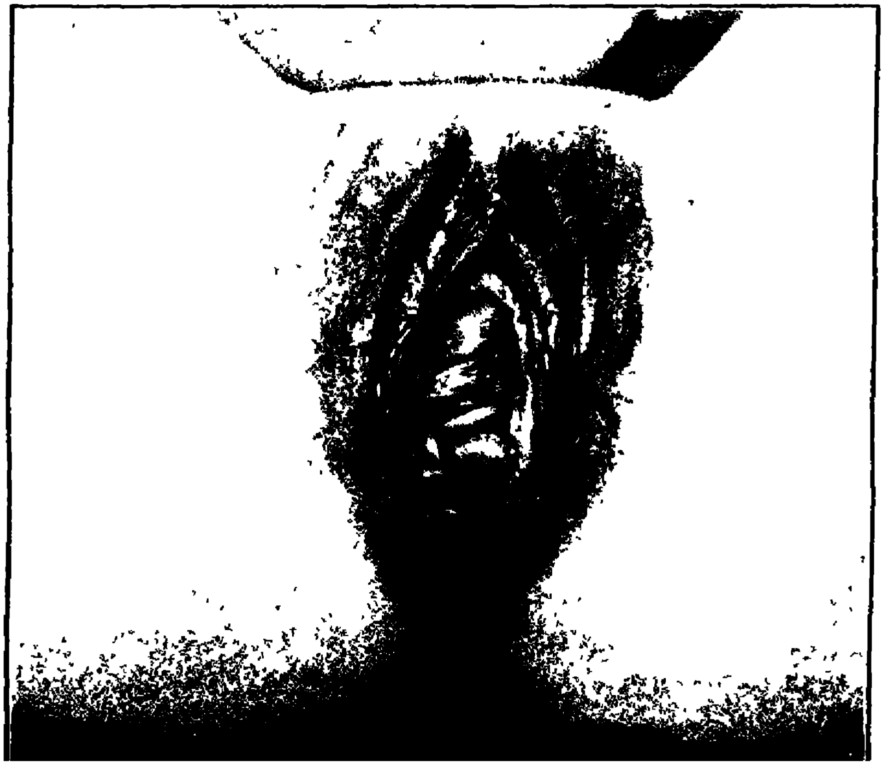

Fig. 164.—Complete tear of perineum.

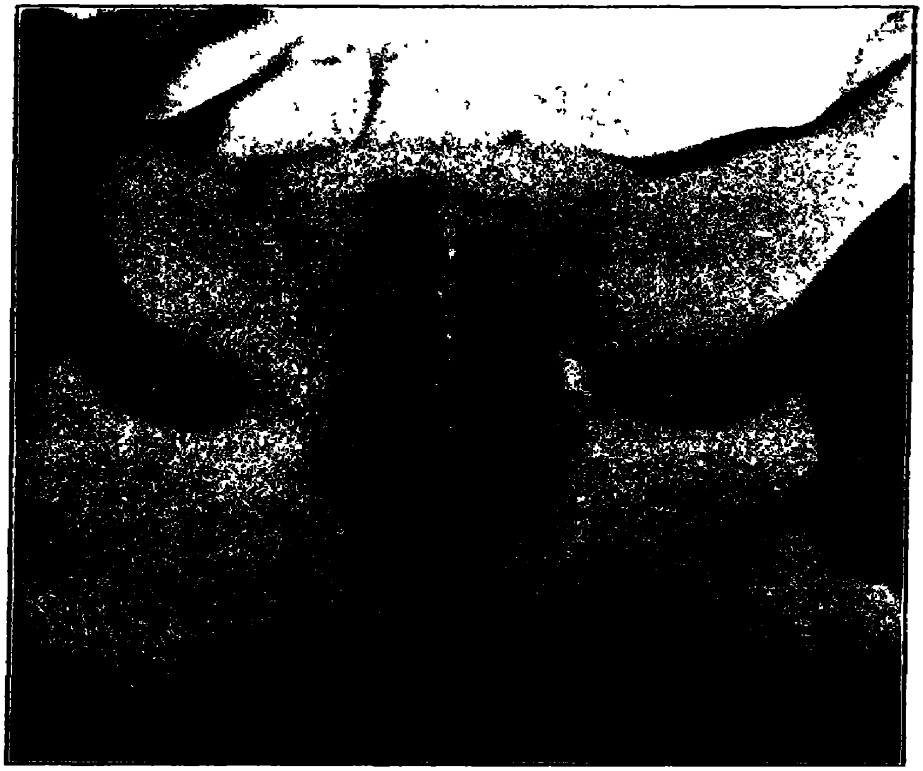

Fig. 165.—Complete tear of perineum.

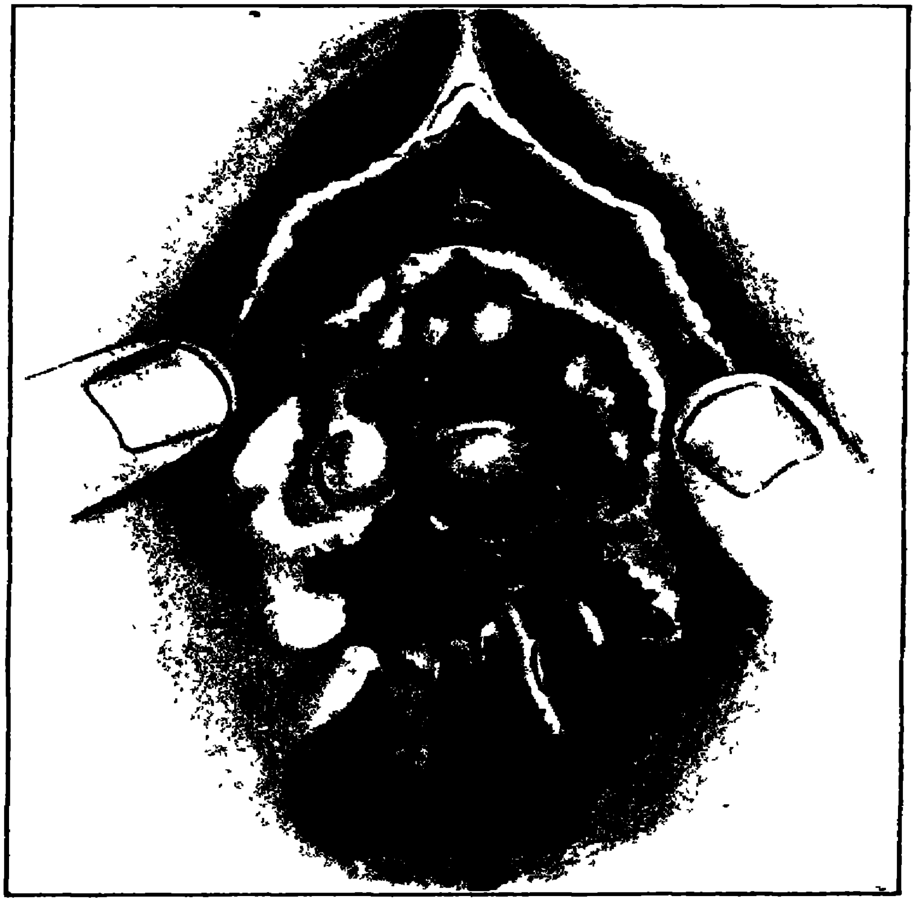

Fig. 166.—Complete tear of perineum.

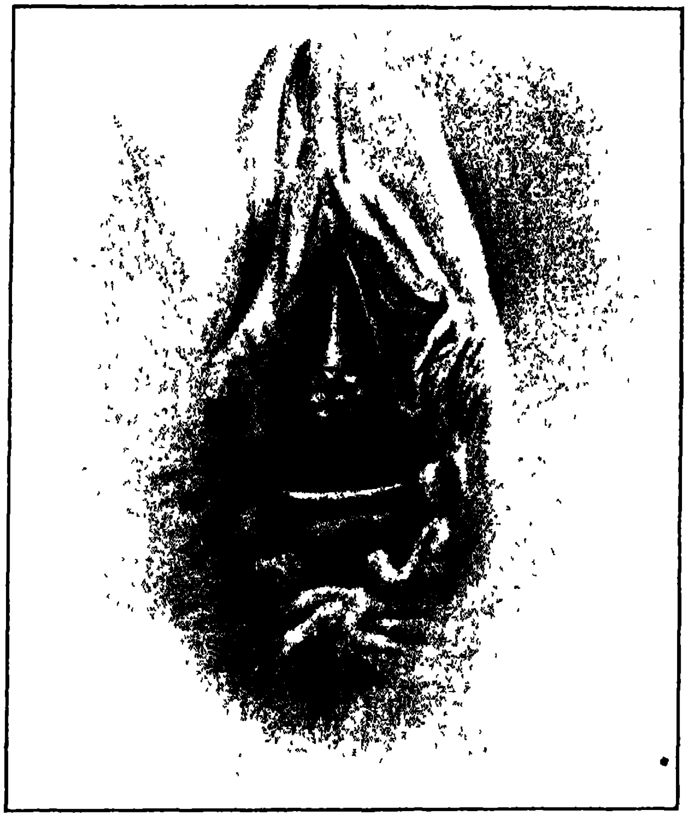

Fig 167.—Complete tear of perineum, destruction of rectovaginal septum, vesicovaginal fistula, gangrene of cervix, and obliteration of the uterine cavity

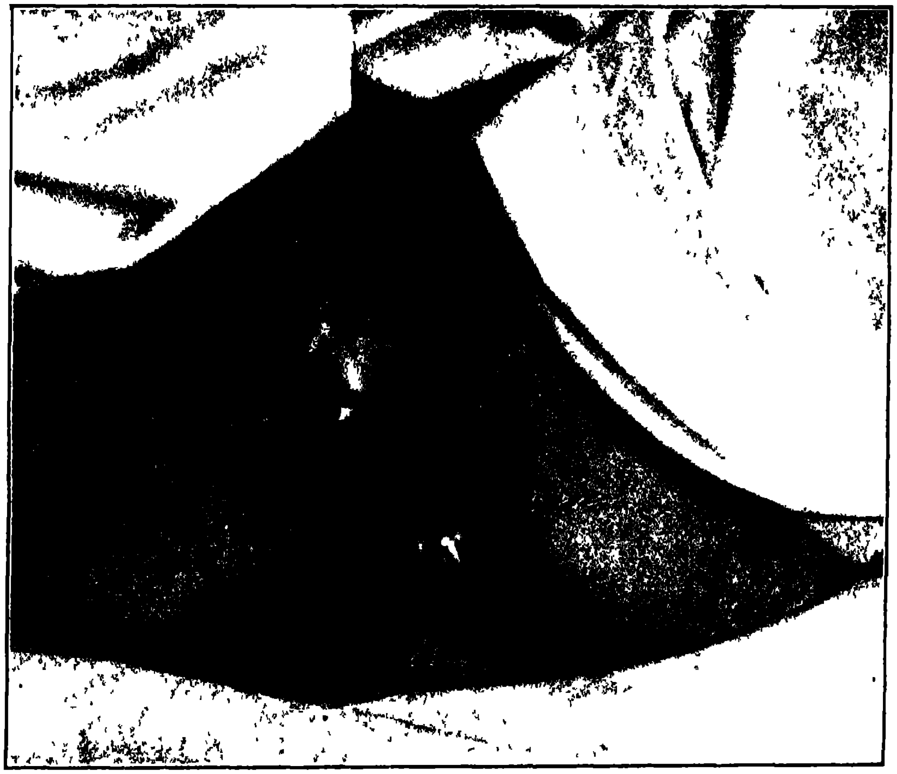

Fig 168.—Complete tear of perineum, atresia of vagina, cystocele, and prolapse of the rectum.

vagina may be made to meet within the vulvar orifice, or rather within the common cloaca made by the junction of the vaginal and rectal orifices. If there has been a considerable degree of spontaneous repair of the injury after labor, or if it has been operated upon without success in joining the ends of the sphincter, the diagnosis of a laceration and a consequent separation of the muscle is not so easy[1] On inspection the ray-like folds of mucous membrane and skin which should completely surround the anus are observed in exaggerated form posteriorly, but are entirely lacking anteriorly, and are not well marked or are not seen at all laterally The anus may gape unnaturally A forefinger inserted in the anus is not grasped by the ring muscle as it should be. If the anterior rim of the anus is palpated between the forefinger internally and the thumb externally, nothing but the thickness of skin and mucous membrane is felt; there is an absence of the band of muscle about as thick as one's little fin-

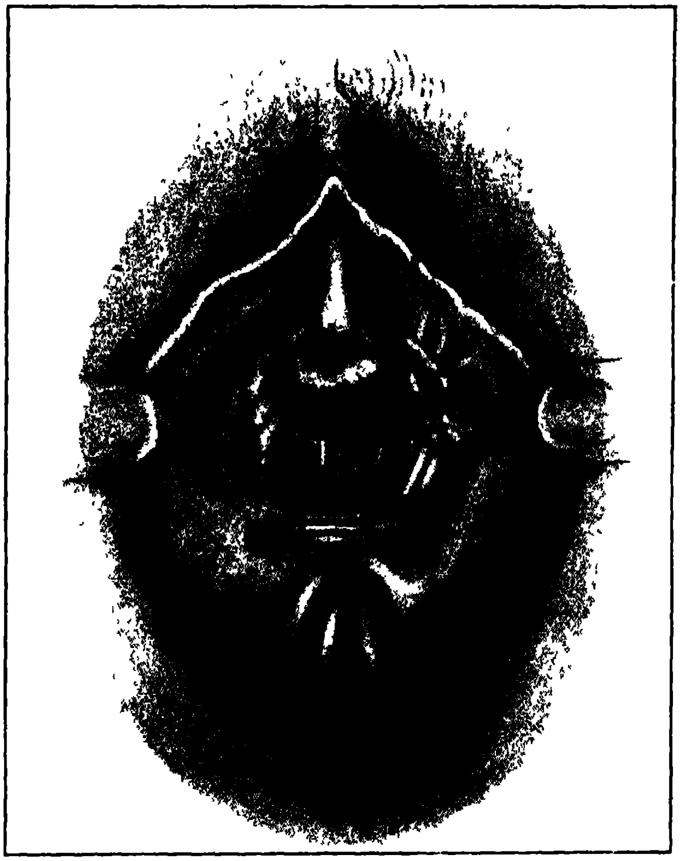

Fig. 169.—Complete tear of the perineum, with attempt at spontaneous repair

ger which should completely surround the anus if the sphincter is intact. Posteriorly the muscle is felt somewhat thicker than normal unless it has undergone atrophy, running in an almost straight line from side to side. The tip of the forefinger can be inserted in a depression at either end of the muscle, caused by the retraction of its fibers pulling in the superimposed tissues to which they have become adherent. There is voluntary and reflex contraction of the muscle unless the injury is an old one and the sphincter is atrophied; but instead of puckering the anus as it should normally, the contracting sphincter pulls the perineal structures on either side of the median line downward and inward in a characteristic and peculiar manner The diagnosis of a central tear of the perineum is made by inspection and by the use of a probe, which passes into the opening on the surface of the perineum and emerges in the vagina

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[1] Every year about half the author's operations for complete tear are performed on patients already operated upon unsuccessfully by other surgeons. Figures 170 to 174 are types of these cases.

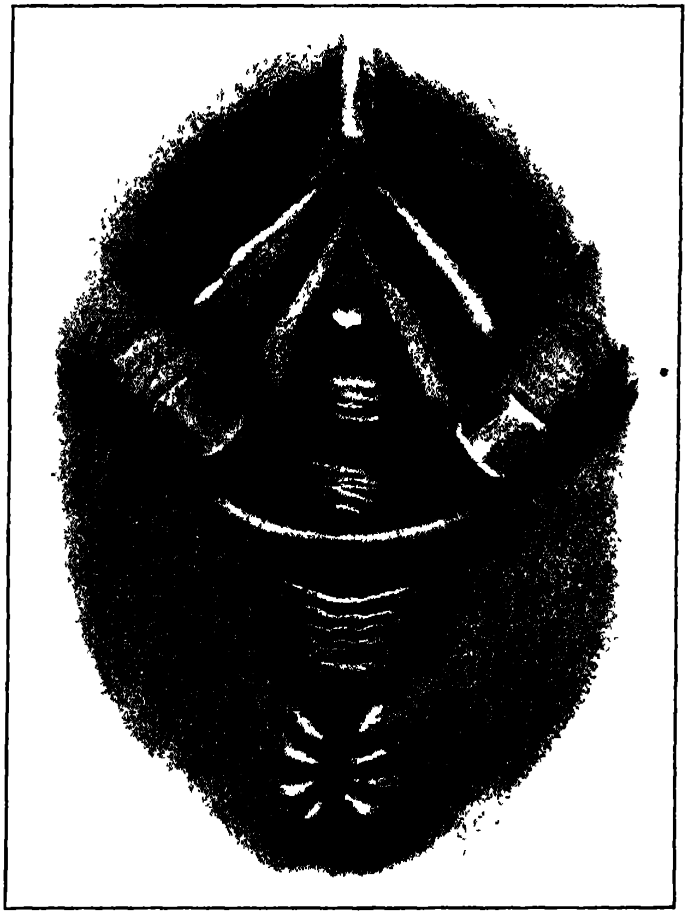

Fig 170 —Unsuccessful operation for complete tear Sphincter not joined Incontinence of gas and feces

The **treatment** of injuries to the vagina differs with the site

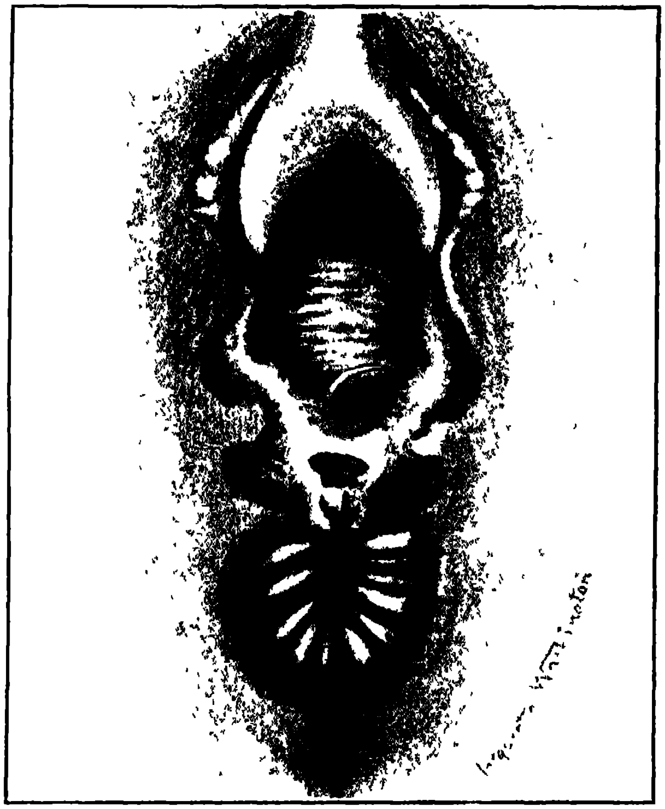

Fig. 171.—Unsuccessful repair of perineum. Rectovaginal fistula, indicated by a curved needle.

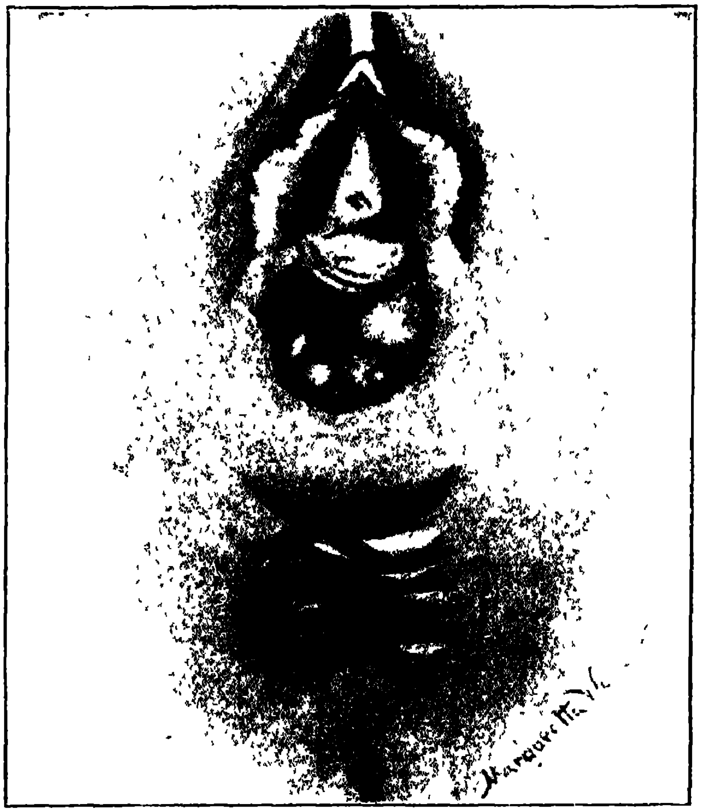

Fig. 172.—Unsuccessful repair of complete laceration of perineum.

and degree of the laceration. Rents and cuts with the blades of a forceps in the canal above the entrance may be immediately repaired with a running catgut stitch if they bleed too much. Later the cicatrices of these injuries may have to be excised, cut, or stretched. (See Stenosis and Atresia.) It is convenient to take up the treatment of the other forms of injury to the vaginal walls and to the pelvic floor separately.

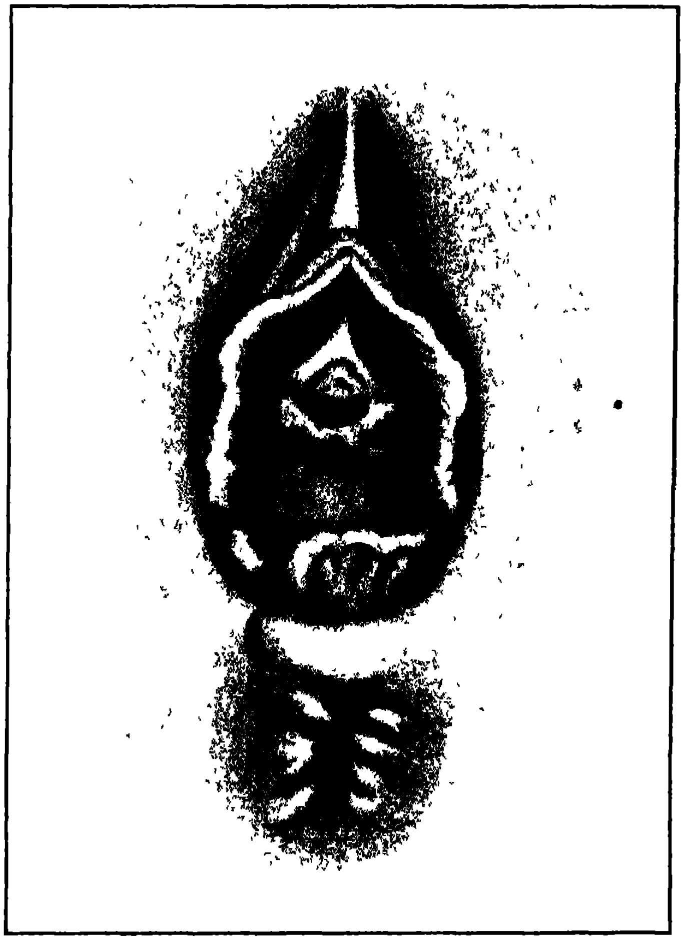

Fig. 173 —Unsuccessful repair of complete laceration of perineum.

Treatment of a Cystocele.—It is possible directly after labor both to recognize and to treat the injury of the anterior vaginal wall that eventually causes a cystocele.[1] Usually the condition is overlooked and uncorrected. In the course of time, perhaps only after many years, the displacement of the bladder gives rise to such discomfort from difficulty in urination and decomposition of residual urine that the patient demands relief. The most satisfactory and the only treatment certain in its results

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[1] See the author's "Text-Book of Obstetrics"

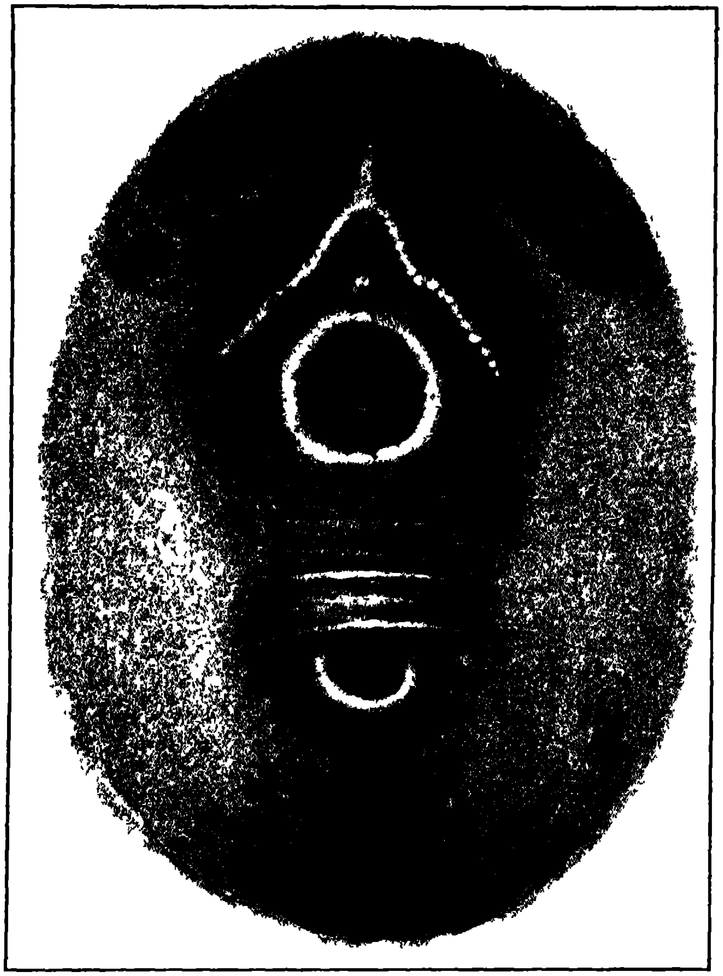


Fig 174 —Three unsuccessful attempts at repair of complete laceration in fourteen years The fourth operation in the University Hospital was successful.

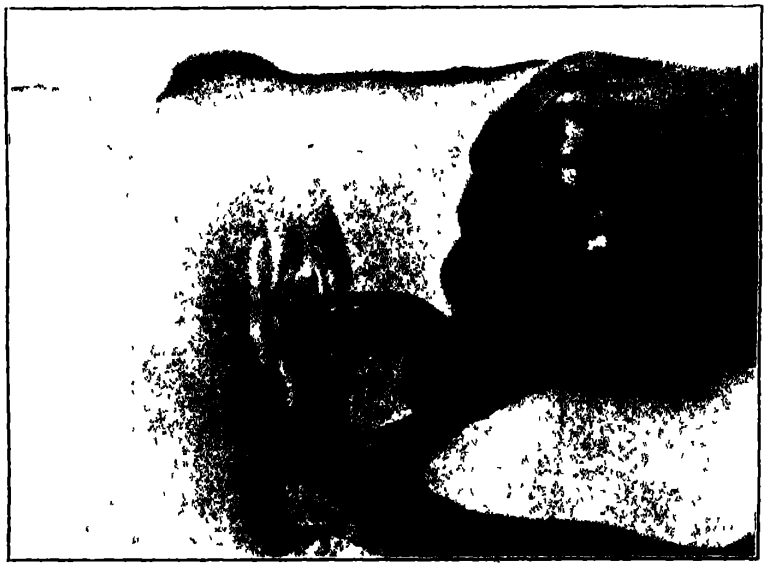


Fig 175 —Insertion of Gehrung's pessary

is the operative. The patient may refuse it, however, or there may be good reasons in the individual case for avoiding an operation The mechanical support of a prolapsed bladder, therefore, must occasionally be considered The most satisfactory of the pessaries for cystocele is Gehrung's. With this instrument the patient may often be made quite comfortable, but it is easily displaced and there is a constant likelihood of ulceration in the anterior vaginal wall Moreover, it will not maintain its position unless the pelvic floor is fairly well preserved.

The manner of inserting a Gehrung's pessary, which requires considerable manipulative skill, is shown in figure 175. After its insertion it is adjusted with the forefinger of the left hand so that the lower bar rests above the symphysis and the upper bar beneath and in front of the cervix The pessary must be removed and cleansed at least once in four weeks, and before it is reinserted the anterior vaginal wall must be carefully inspected, by means of a duck-bill speculum with the patient in Sims' position, for irritation or ulceration, which would contraindicate the use of the support for two weeks A globe pessary supported by a napkin or a T-binder, a Thomas' anteversion pessary, a Skene's

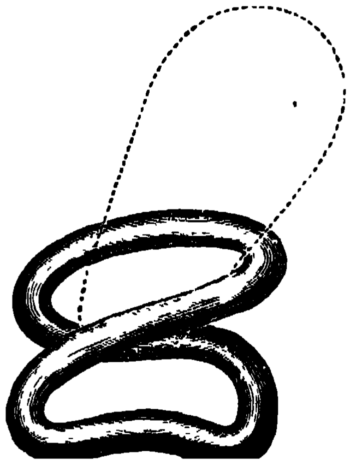


Fig 176 —Gehrung's anteversion pessary

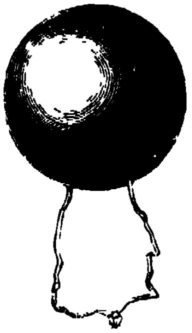


Fig 177 —Globe pessary.

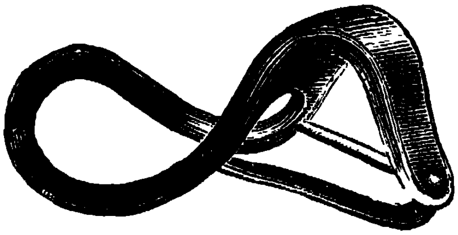


Fig 178 —Skene's cystocele pessary.

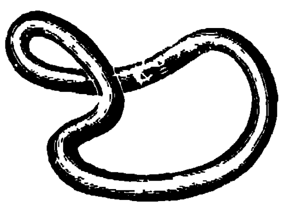


Fig 179 —Schultze's sleigh-shaped pessary

cystocele pessary, or a Schultze's sleigh pessary may in individual instances be more satisfactory than the Gehrung's, but the latter is the more uniformly reliable.

As already stated, the operative treatment is preferable. The ideal operation must rejoin the torn ends of the urogenital trigonum muscle, remove redundant tissue (the stretched and relaxed mucosa), and re-establish a firm connection between the anterior vaginal wall and subjacent structures. These requirements are best fulfilled by the operation represented in figure 180

The anterior vaginal sulcus on the left side is displayed by three bullet forceps making traction at the three angles of the sulcus. As the woman lies in the dorsal position on the table the sulcus is not easily accessible and can not conveniently be denuded, as it lies hidden within the vagina; but by fixing one bullet forceps alongside the orifice of the urethra, the other on the opposite vaginal wall, and the third half-way up the vaginal wall at the apex of the sulcus, the triangular area involved in the injury comes plainly into view. The triangle is marked out with a knife, and the mucous membrane is readily dissected off by scissors in one piece, which takes but a minute or two. The other side is treated in the same manner. Usually the tear is deeper on the left side and may be confined to that side. The sulcus being denuded, the sutures of silkworm-gut are inserted just as they are in the posterior sulci in an Emmet operation. They are not yet united, but are clipped temporarily with hemostats. The cervix is pulled out of the vulva and the rest of the operation is performed by making an oval denudation between and above the sulci and in-

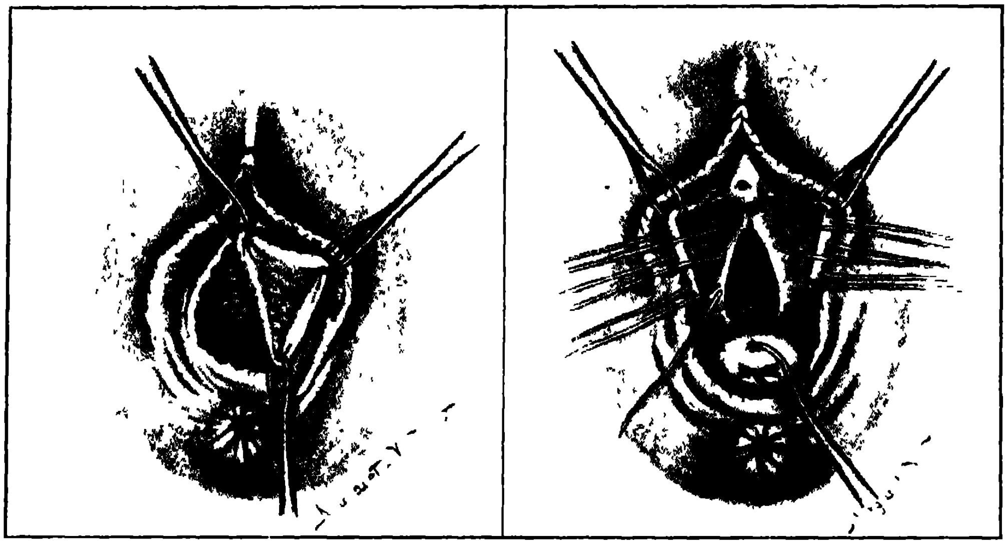


Fig. 180.—The author's operation for cystocele.

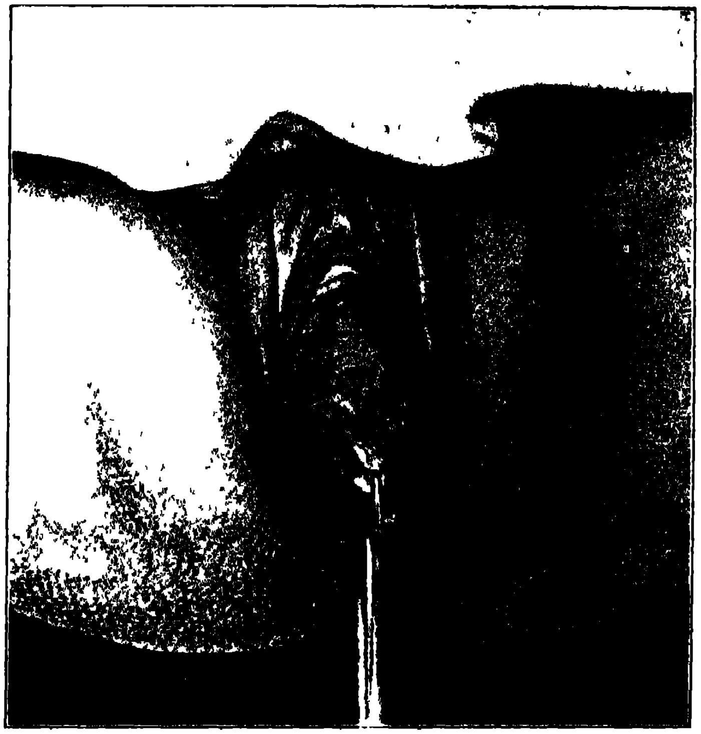


Fig. 181.—Exposure of the cystocele by pulling the cervix uteri outside the vulva for the oval denudation and tier suture of Martin

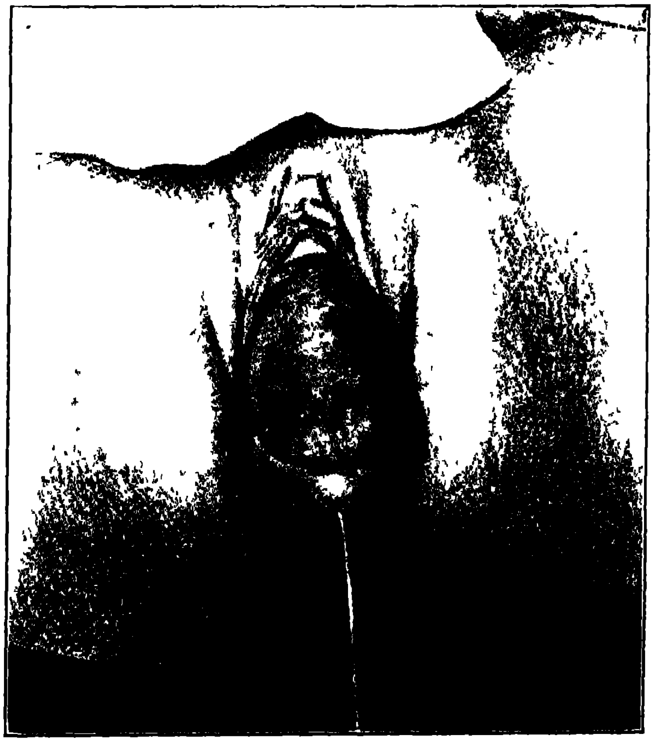
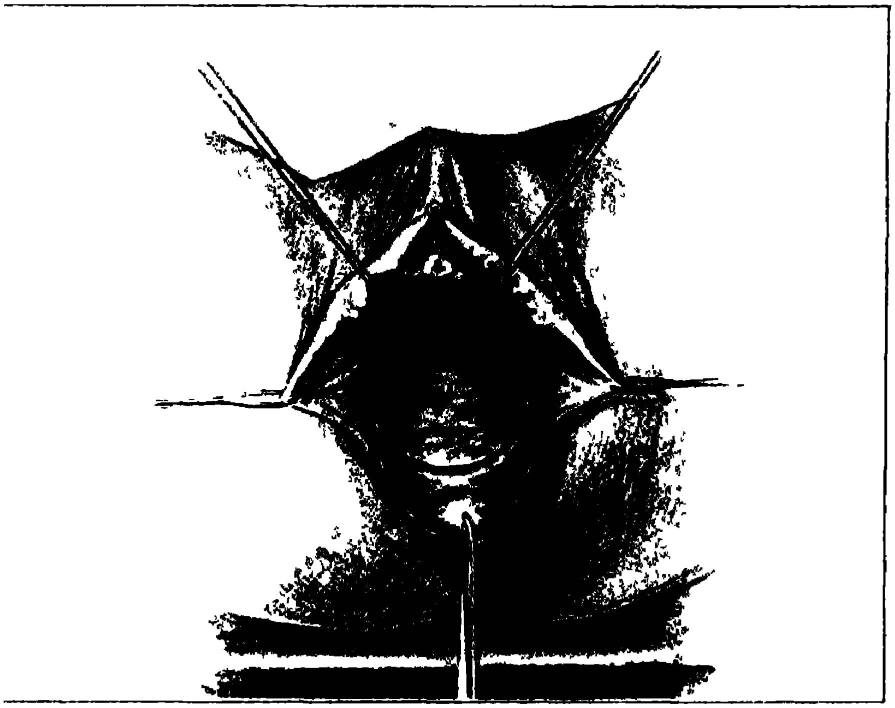


Fig. 182.—Incision to mark out the area of denudation.



183 —Loosening the upper margin of the flap and catching it with tissue forceps or hemostats

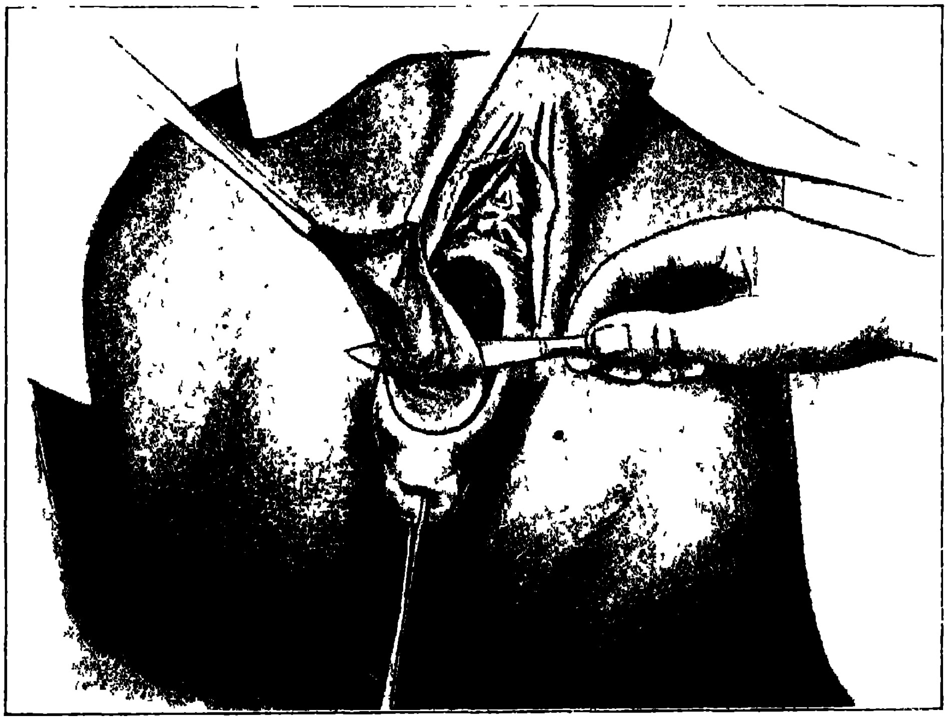


Fig. 184 —Dissecting off the flap in one piece with a knife

serting a buried continuous tier suture of catgut. After the closure of the oval denudation, the sulci sutures are united with shot.

Stoltz's operation of a small circular denudation and a purse-string suture around the edges of the denuded surface does not give a permanently satisfactory result. The large oval denudation and tier suture of catgut advocated by August Martin is an excellent operation, but it does not unite the torn muscles which should support the lower anterior vaginal wall and the urethra, and therefore it is not always permanently successful.

It is always necessary to unite with the operation for the cystocele an Emmet's or a Hegar's operation to restore the pelvic floor and to contract the vagina, even though the latter may not appear on a cursory examination to be much injured or relaxed.

Treatment of Lacerations of the Perineum and of the Pelvic Floor.—All lacerations of the perineum and of the vaginal sulci should be repaired immediately after or within a few days of labor.[1] If there is no visible tear, but a palpable injury of the levator ani muscle, a few stitches should be inserted either from the perineum by a large curved needle with a wide lateral sweep, through the fibers of the levator ani muscles, or from the surface of the posterior vaginal wall In consequence of the improved training in obstetrics received by the present generation of medical students, the hope is justified that the necessity for secondary operations on the pelvic floor will become almost as rare as the need of operations for vesicovaginal fistulæ, which has enormously decreased of late years

In rare instances the woman's general condition, a bruised, sloughing wound, local infection, or edema may forbid an immediate perineorrhaphy, which must be postponed for perhaps two weeks. Performed at any time from twenty-four hours to two weeks after labor, the operation is called intermediate During this period, as a rule, no denudation is required The torn surfaces are freshened by scraping with the sharp edge of a knife or a sharp curet, and the sutures are introduced as in a primary operation. If the repair of the injury is undertaken more than two weeks after labor, the operation is called secondary

Secondary perineorrhaphy is performed for three indications · the repair of a median tear of the perineum , the repair of a perineal tear involving the sphincter ani and rectum ; the repair of injury to the levator ani muscle, with a coincident correction of displacement of the posterior vaginal wall (rectocele) and a gaping, relaxed, subinvoluted vagina For each of these three indications a different operative procedure must be selected.

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[1] For the varieties, appearance, diagnosis, and repair of lacerations of the lower birth canal after labor, see the autho.'s "Text-Book of Obstetrics."

Secondary Operation for a Median Perineal Tear.—The labia are caught by double tenacula or bullet forceps at the upper margin of the tear on a level with the lowermost carunculæ myrtiformes, and are stretched apart The triangular space to be denuded, with the base above and the apex below where the tear terminates, is thus displayed One blade of a sharp-pointed scissors is inserted under the skin at the lower angle of the tear, and is run up the mucocutaneous margin, as one would slit a piece of muslin, to the bullet forceps on one side A similar cut is made upon the other side. The two lines thus formed are joined above by a straight transverse incision. The surface to be denuded, being thus isolated, is dissected off in one piece by small blunt-pointed scissors curved on the flat, or is taken off in strips if the operator prefers the slower and more tedious method The raw surfaces are then brought together by interrupted silkworm-gut sutures running straight across the wound, buried all the way, entering and emerging upon the skin about an eighth of an inch from the raw surfaces. The stitches are knotted or shotted. The former method avoids the pits in the line of the wound which usually result from the use of a shot, but the latter secures a neater apposition and is quicker As one important object of this operation is to rejoin the lacerated transversus perinei muscle, curved needles should be used and the suture should take a circular sweep out into the tissues on either side of the wound so as to catch the retracted ends of muscle. This principle applies also, and with greater force, to the repair of the other more important muscles of the pelvic floor that are injured in labor, the levator and the sphincter ani muscles.

Secondary Perineorrhaphy for a Complete Tear of the Perineum Involving the Sphincter Ani Muscle and the Rectovaginal Septum—Before undertaking an operation to unite a torn sphincter, it is essential to thoroughly evacuate the intestines, especially the lower bowel. The preparation of the patient begins two days before the operation. On the first night two drams of Rochelle's salts are given in a tumbler of water. On the second, the night before the operation, a half ounce of Epsom salts in a tumbler of water is administered. On the morning of the operation an enema of soapsuds (1 pint) and turpentine (1 dram) is given, followed by repeated rectal injections of a pint to a quart of water until no more fecal matter is brought away. It requires ordinarily at least six such injections to remove all the contents of the lower bowel so as to prevent an evacuation of feces during the operation, which might infect the wound and the sutures and prevent primary union.

The first step in the operation is the stretching of the sphincter, to temporarily paralyze it and so to prevent the spasmodic contraction of the muscle, which might interfere with the union of its ends. Moreover, the relaxation of the muscle permits evacuation of the bowels after the operation with the least strain upon the sphincter. With the hands protected by rubber gloves the operator seizes both ends of the sphincter ani between the forefingers in the rectum and the thumbs externally and stretches it forcibly for about a minute. The gloves are changed or are well rinsed in bichlorid solution. Bullet forceps are fastened to the labia on each side at the level of the lower carunculæ myrtiformes, and the labia are pulled apart by assistants. A strand of silkworm-gut is fastened to the vaginal mucous membrane at the apex of the tear in the rectovaginal septum, and is tied in a loop by a single knot. This guide suture is lifted toward the urethra. The rectovaginal septum is now slit with a knife transversely after the flap-splitting method, and the incision is then carried downward over the ends of the sphincter, which are marked by easily perceptible and palpable dimples. The knife is then drawn along the mucocutaneous margin upward on both sides to the bullet forceps. From these points the area to be denuded is marked with small sharp-pointed scissors and differs

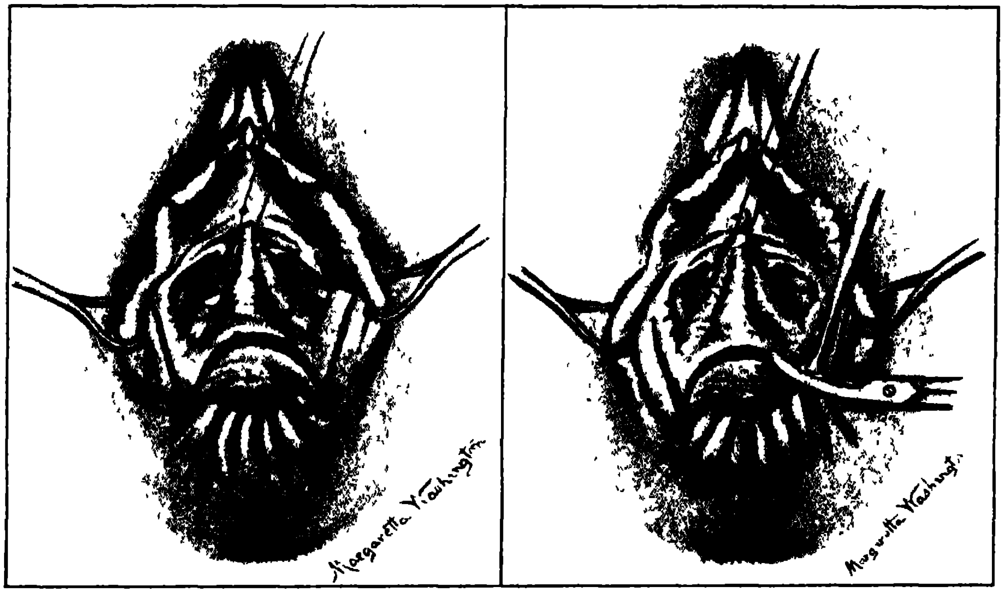

Fig 185 —*A*, Incision for complete tear operation; *B*, denudation of the tissues over the ends of the sphincter

as the perineal tear is simply median or extends up the vaginal sulci. In the latter case the denudation in the vagina is made as for an Emmet's or a Hegar's operation, subsequently to be described After marking off the area to be denuded, the flap made by the first incision is freed by a dissection upward under the vaginal mucous membrane and inward from the labial and perineal surfaces. The outer edges of this flap are removed, but the tissue in the median line is spared as much as possible, and care is exercised not to excise rectal mucous membrane on account of troublesome hemorrhage from the hemorrhoidal veins. The dissection described lays bare the ends of the sphincter To insure their complete exposure, the skin over the lower margins of their ends is seized with a rat-tooth forceps and snipped off with scissors The cicatricial tissue over the ends of the muscle is also seized with a rat-tooth forceps, lifted up and cut away with scissors curved on the flat, just enough tissue being removed to expose the raw muscle and not to shorten it

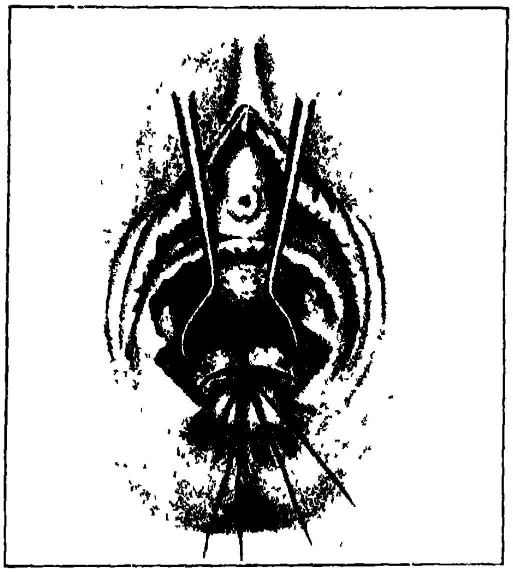

Fig 186.—Pulling the ends of the sphincter together with large tenacula, while deep sutures are inserted through them from the rectum

If the tear runs up the rectovaginal septum, the first sutures of silkworm-gut are inserted from the rectum, half-way through the septum on both sides and back again into the rectum, where they are knotted. From two to five are required. Before inserting the sphincter sutures the ends of the muscle are seized with tenacula, pulled out of the depressions in which they lie, and approximated in the median line The sutures through the sphincter, two in number, of silkworm-gut, are inserted from the rectal side, with a broad sweep of a curved needle deep into the substance of the muscle, which they completely traverse, crossing the wound, and emerging in what will be the rectal surface of the anus when the sphincter is joined. The sutures through the sphincter are tightly knotted with a triple knot. After inserting the rectal and sphincter sutures, a long barrier stitch is inserted, beginning just above the united sphincter, running up the rectovaginal septum to the upper angle of the tear in it, crossing the wound, coming down the other side, and emerging opposite the point of first insertion on the perineum, where it is fastened by a shot. The remainder of the operation is performed as one for a median perineal tear or the Emmet or Hegar operation for injury to the pelvic floor.[1]

Another plan of operating which avoids the troublesome necessity of removing the rectal stitches after the wound has healed is as follows: After completing the denudation of the rectovaginal septum, the ends of the sphincter, and the site of the vaginal injury, close-set interrupted sutures are inserted from the vagina, through the depth of the wound to, but not through, the rectal mucous membrane The anterior rectal wall may be pulled down, after the flap-splitting dissection, until it lies under the joined ends of the sphincter, thus protecting the wound from fecal evacuations during convalescence. Two silkworm-gut sutures are inserted through the sphincter, with the precautions already described, the stitches entering and emerging on the skin surface of the anus Before uniting any of these stitches, each one of which is held in the grip of a hemostat, the whole raw surface between the vagina and rectum is whipped together with a running double tier stitch of formalin catgut, starting at the upper angle of the tear in the rectovaginal septum, running down the lower part of the wound, just avoiding the rectal mucous membrane, taking two turns through the ends of the sphincter, returning along the upper part of the wound, and ending opposite the point of first insertion in the vagina Only one knot, therefore, is required at the upper angle of the wound on the vaginal surface The interrupted sutures are then united with shot burying the catgut stitch and uniting the whole extent of denuded surfaces between the vagina and rectum. The vagina is packed lightly with a strip of iodoform gauze, which is removed in twenty-four hours No vaginal douches are given, as they are unnecessary and may be harmful. The patient is allowed to pass water if she can. If the catheter is used, it is discontinued as soon as possible After urination the vulva is irrigated by sterile water poured over it out of a pitcher, with the patient on a bedpan.

In the after-care of the patient the diet should consist of such articles as will not leave much detritus in the bowel; soups, tea, beer, junket, wine jelly, given in small quantities every three hours As soon as the patient's stomach has become tolerant after the anesthetic, the administration of a laxative should be begun, so that there may be a liquid movement of the bowels within twenty-four or thirty-six hours of the operation. Thereafter two or three such movements daily must be secured, for at least two weeks, and the fecal evacuations must be kept soft for six weeks or more after the operation. A hard mass of feces has torn a united sphincter apart more than three weeks after an operation for a complete tear The best laxative for the first two weeks is a tumbler of Carlsbad water and a teaspoonful of Sprudel salts morning and evening. A third dose in the middle of the day may be required. After the second week any of the simpler laxatives suffice, such as licorice powder, syrup of senna, cascara, or weak solution of Rochelle's salts. The prolonged use of Epsom salts is productive of enteritis and proctitis, so that they are unavailable.[1]

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[1] The author has averaged from four to twenty operations for complete tear every year for the last fifteen years with uniform success by this technic He hesitates, therefore, to adopt any of the recent modifications proposed, which utilize catgut more extensively.

The stitches are removed on the sixteenth day. If sutures have been required in the rectovaginal septum and have been knotted in the rectum, they are removed with the patient in the knee-chest posture, through a narrow bivalve rectal speculum and with the aid of an electric headlight Great care must be exercised not to cut off both ends, as the knots are usually buried in the mucous membrane and it is a troublesome task to cut and remove the stitch in the confined area in which one must work.

The patient is allowed to sit up at the end of three weeks and is cautioned to keep the bowels softened by laxatives for weeks to come.

If the sphincter has been torn for years it undergoes atrophy and may be incapable of vigorous contraction even if it is firmly united, so that in spite of a successful operation there is partial incontinence of gas and feces. The application every other day for three months of a faradic current of electricity to the sphincter has restored its contractile power in two cases under the author's care in which the muscle in one case was repaired fourteen years after the original injury and after three unsuccessful attempts had been made by other operators to join its ends, and in another after ten years. In reoperating upon a case of complete tear after an unsuccessful attempt at repair,[2] there must be some modification of the technic just described. In almost all such cases the perineum has been restored, but the ends of the sphincter are separated a half inch or more, and there is complete incontinence. Considerable tissue has usually been sacrificed in the former operation, and there is none to spare, so that the flap-splitting principle must be utilized to the full. The sphincter is stretched as in all these operations. A straight incision is made in the median line of the perineum, branching off outward and downward in the form of an inverted Y. The skin is turned back from the lines of incision so that the retracted ends of the sphincter are freely exposed. They are superficially denuded, caught by tenacula, and brought together in the median line Two sutures of silkworm-gut on a curved needle are inserted from the skin surface of the anus, carried with a broad sweep deeply into the two halves of the muscle and are united with shot The perineal wound is brought together with interrupted sutures of silkworm-gut. In cases of stretched skin perineum and widely separated ends of the sphincter after an unsuccessful operation, the incision may be made as represented in figure 187.

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[1] In the case of a young girl (Fig. 167) obstinately constipated and with such an irritable stomach that laxatives were not tolerated, the author adopted with success a suggestion of Leopold, to keep the bowels locked for sixteen days, on a meager diet, and then to open them with calomel and salines and by oil and ox-gall enemata. This plan is occasionally convenient, but is not to be generally recommended

[2] The principles that should govern these operations can not be generally well understood, for every year the author has two to eight operations to perform on women who have already been subjected to one or more unsuccessful attempts to repair a torn sphincter.

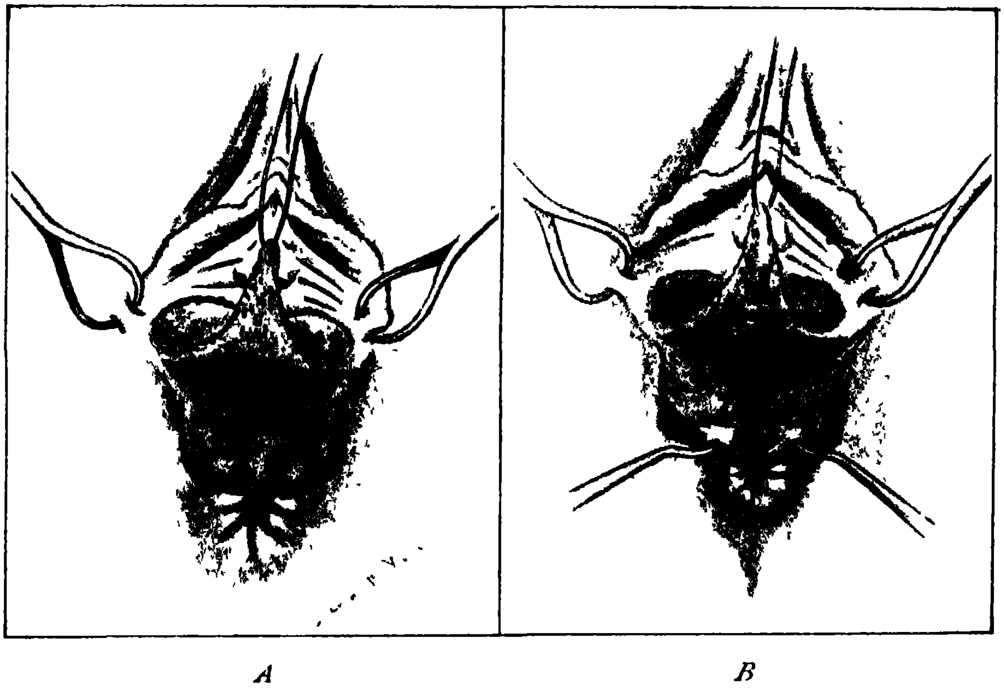

Fig 187.—*A*, Exposure of the ends of the sphincter in a reoperation for complete tear; *B*, catching the ends of the sphincter with tenacula

A common cause of comparative failure after the operation for complete tear is the persistence of a rectovaginal fistula just above the united sphincter muscle. This complication most frequently occurs in the hands of those operators who depend upon Emmet's triangular stitch to join the sphincter, which is not to be recommended. The most satisfactory treatment is to cut the sphincter again with one blade of a scissors in the fistula and the other externally, to curet the fistulous tract, and then to join the ends of the sphincter as in the operation just described

Secondary Perineorrhaphy for Injury to the Levator Ani Muscle, Rectocele, Overstretching and Subinvolution of the Vagina.—Lacerations of the vaginal sulci, involving the levator ani muscle and resulting eventually in a rectocele, are best repaired in the vast majority of cases by the Emmet operation. Many other operations have been proposed and are practised for injuries to the pelvic floor and to the vagina. Bischoff's butterfly-wing denudation and vaginal flap, adopted and modified by Goodell, Tait's flap-splitting method, Martin's parallel denudation of the sulci in two narrow strips, have had and still have their advocates, but the author for many years has employed but two operations for restoring the pelvic floor and narrowing the vagina —those devised by Emmet and by Hegar. Thomas Addis

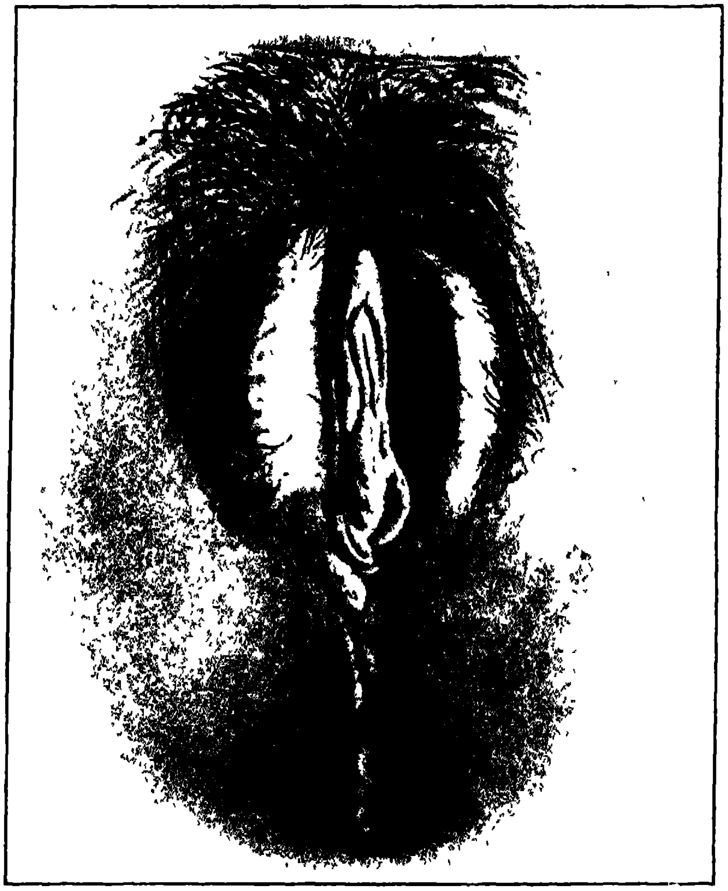

Fig. 188.—Photograph of result of operation on patient represented in figure 167 [1]

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[1] Figs. 188, 189, 190 should be contrasted with Figs. 170-174

Emmet[1] in October, 1881, performed the operation for injury to the pelvic floor which bears his name. It was the most notable contribution to the plastic surgery of the female pelvis, and has proved a boon of incalculable value to surgeons and their patients the world over. By the triangular denudation of the sulci and of the rectocele below its crest; the insertion of the stitches in the sulci from above downward so that they pull back the posterior wall of the vagina as they unite the torn fibers of the levator ani muscle; by the insertion of the "crown suture" which lifts the end of the posterior column of the vagina to its normal position, unites the ends of the bulbocavernosus muscles, and restores the normal caliber of the vulvar orifice, the most perfect correction of a common and serious injury of labor is achieved In a small proportion of cases, however, the Hegar operation is preferable If the posterior vaginal wall is stripped off its subjacent attachment as the anterior wall is in a cystocele, and projects from the vulva without an accompanying rectocele, if the vagina is very much dilated and subinvoluted with a widely gaping vul-

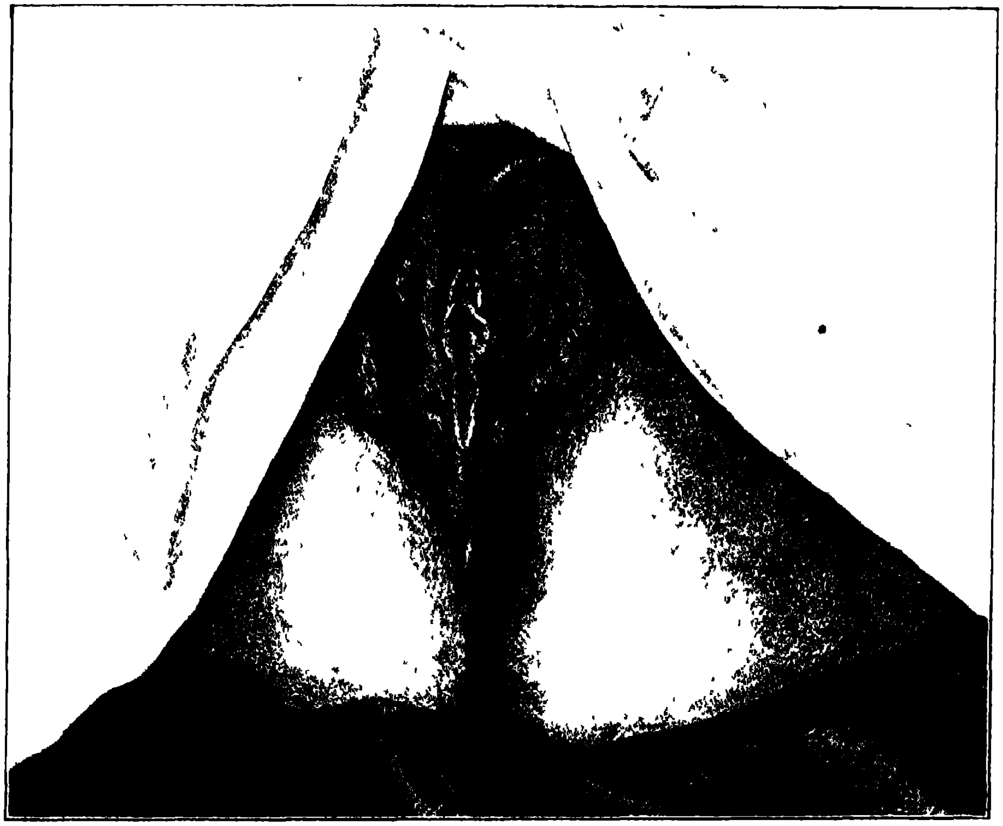

Fig. 189—Photograph of result of successful operation for complete tear

var orifice, and if there is a decided prolapsus uteri, the triangular denudation of Hegar, running far up the posterior wall of the vagina, gives a firmer support, more radically contracts the vaginal canal, and promises a surer retention of a prolapsed uterus than does the Emmet operation, with a tongue of the original overstretched and relaxed vaginal mucous membrane intervening between the sutures in the denuded and approximated surfaces of the two sulci.

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[1] "Principles and Practice of Gynecology," 3d ed, Philadelphia, 1884

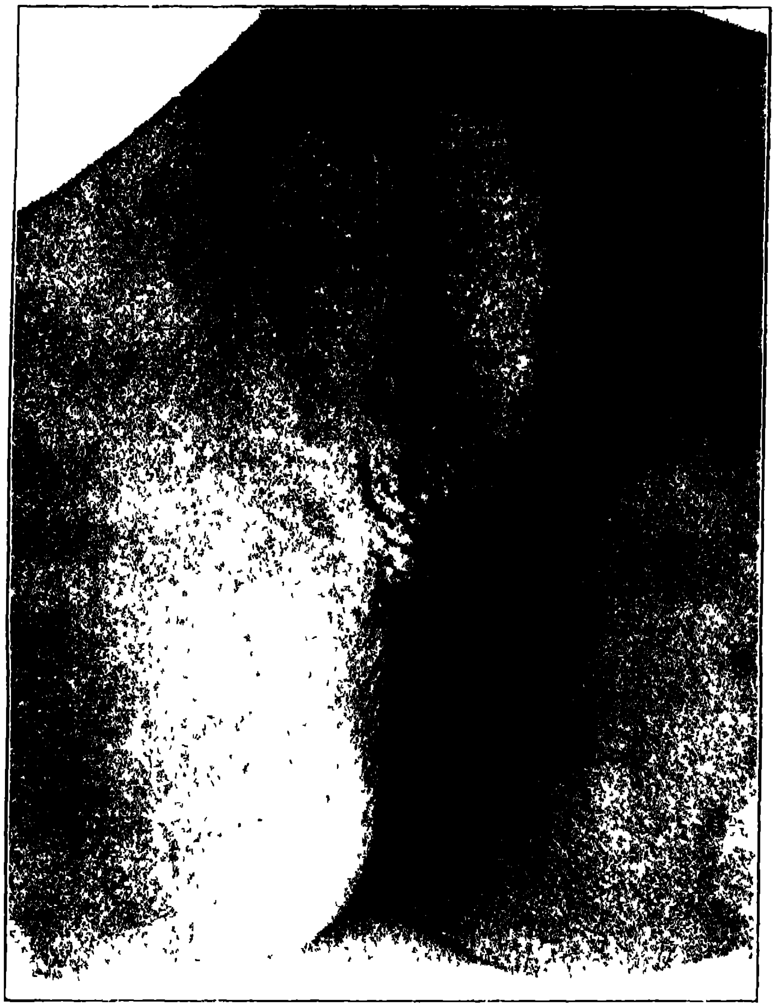

Fig. 190.—Result of repair in complete tear (young girl)

The Emmet operation is performed as follows · Two bullet forceps are fastened to the labia majora at the level of the lowermost carunculæ myrtiformes. A guide suture is passed through the mucosa of the posterior vaginal wall at the crest of the rectocele. The bullet forceps and the point of insertion of the guide stitch should meet just below the urethra, when the two former are approximated and the latter is lifted directly upward (Fig. 192). The bullet forceps on one side is pulled outward and downward and the guide suture is pulled downward and to the

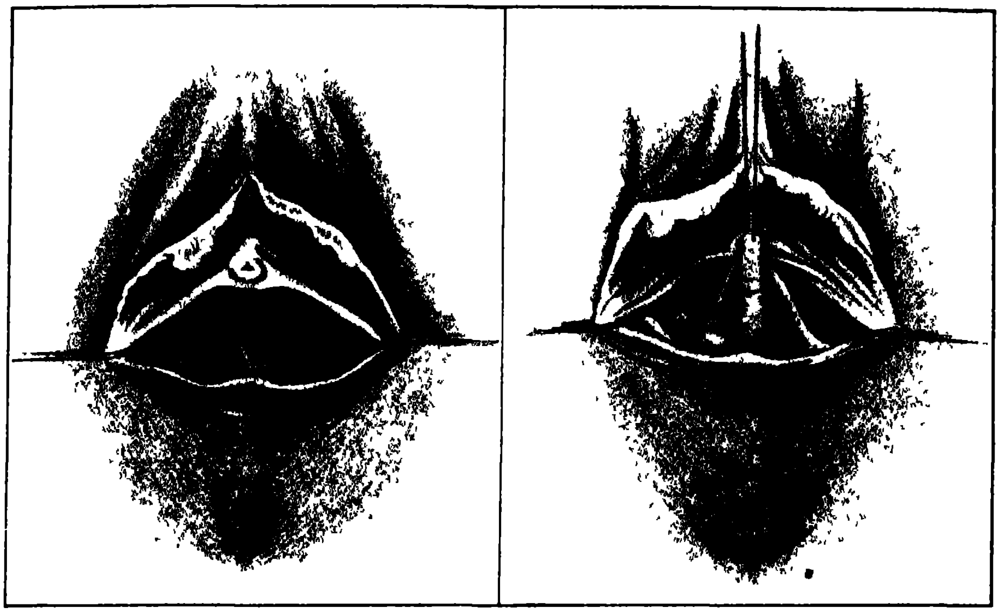

Fig 191.—Fixing the three points as guides in the operation with bullet forceps and a guide suture.

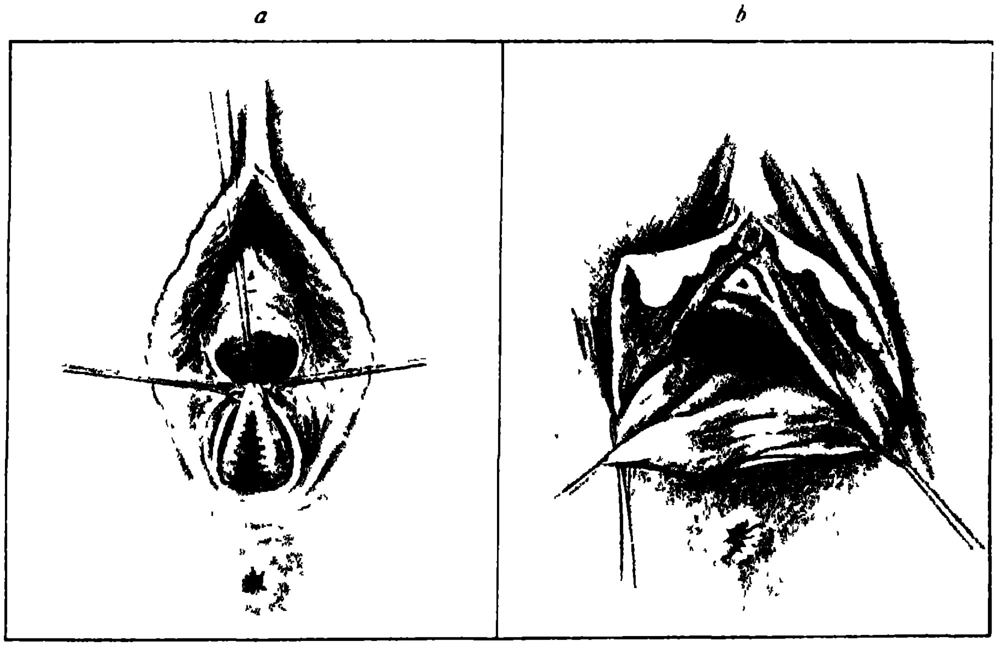

Fig. 192 —The Emmet operation : *a*, Approximation of the upper edges of the perineal tear and the crest of the rectocele ; *b*, displaying the left sulcus

opposite side. The injured sulcus is displayed and the corrugations of mucous membrane meet above at the apex of the original laceration showing the extent of the injury. One point of a sharp-pointed straight-bladed scissors is inserted at the bullet forceps and run up the mucosa of the sulcus to the apex of the tear; the scissors is similarly inserted at the guide stitch and the mucosa is slit until the two incisions meet (Fig. 193) The triangle thus mapped out is dissected off in one piece by blunt-pointed scissors curved on the flat. The same dissection is made on the opposite side. The two forceps are then pulled apart and

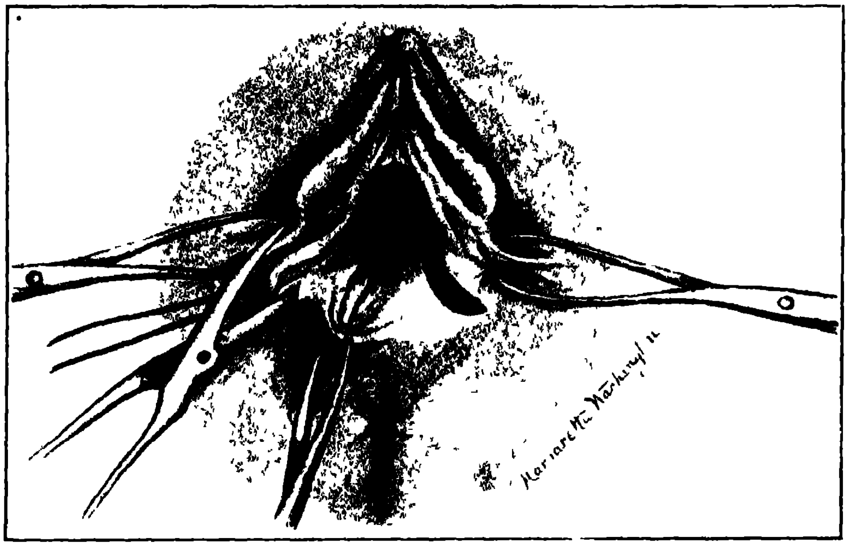

Fig 193 —Marking off the area to be denuded with scissors

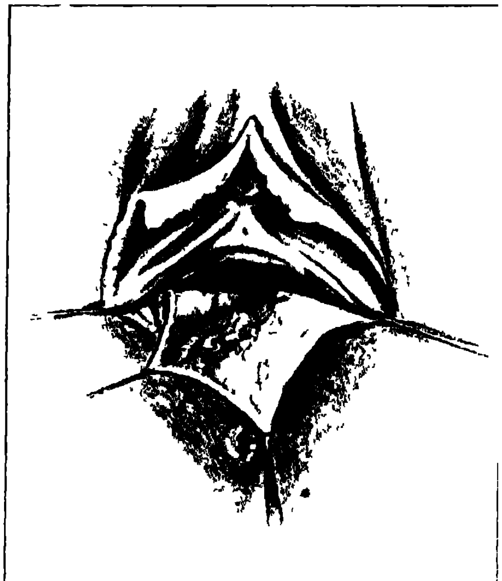

Fig 194 —Flap dissected off with scissors in the left sulcus.

the guide stitch is held up in the median line: A third triangle of undenuded mucosa appears in the middle line which is taken off in one piece. The denudation of an Emmet's operation may thus be completed in a few minutes. It can be done in a third of the time required by an operator who takes off the mucous membrane strip by strip.

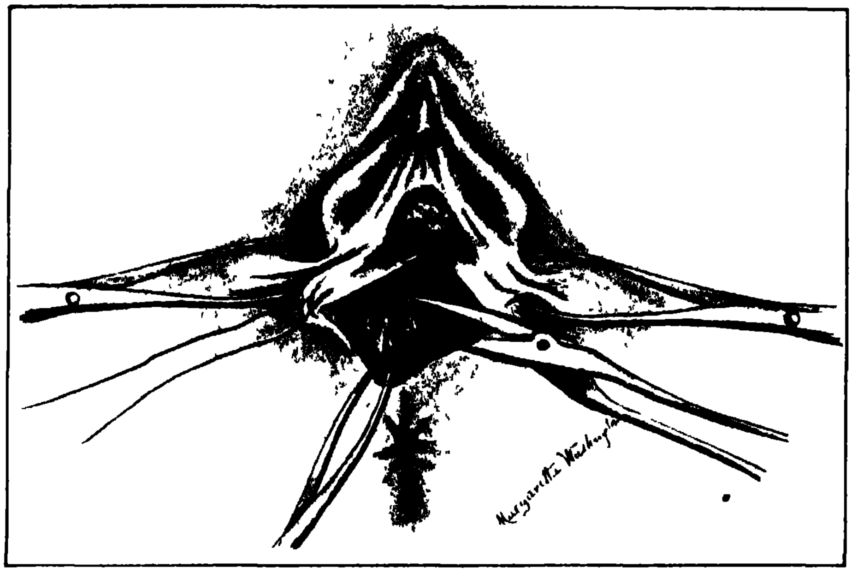
Fig 195 —Cutting off the flap at its base.

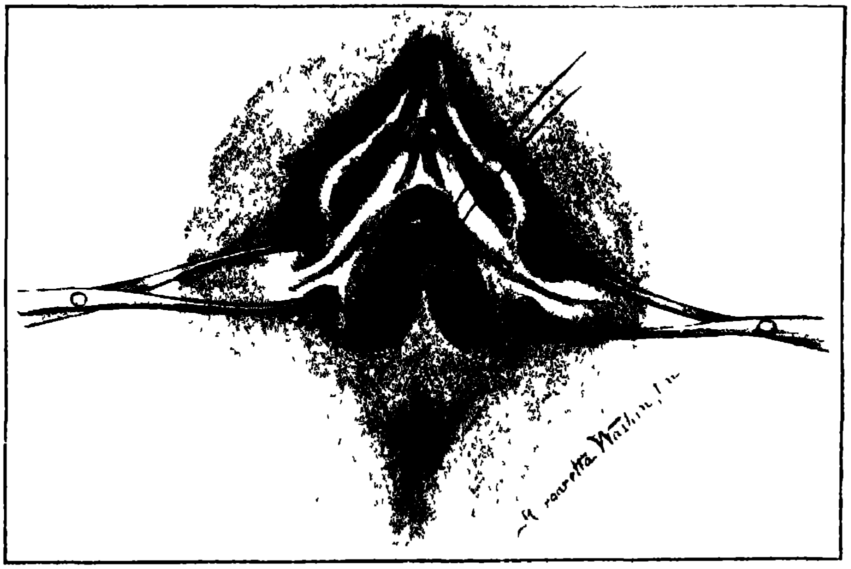
Fig. 196.—Both sulci denuded.

The stitches in the sulci are inserted by the Emmet needle and should be of silkworm-gut throughout. Catgut is too unre-

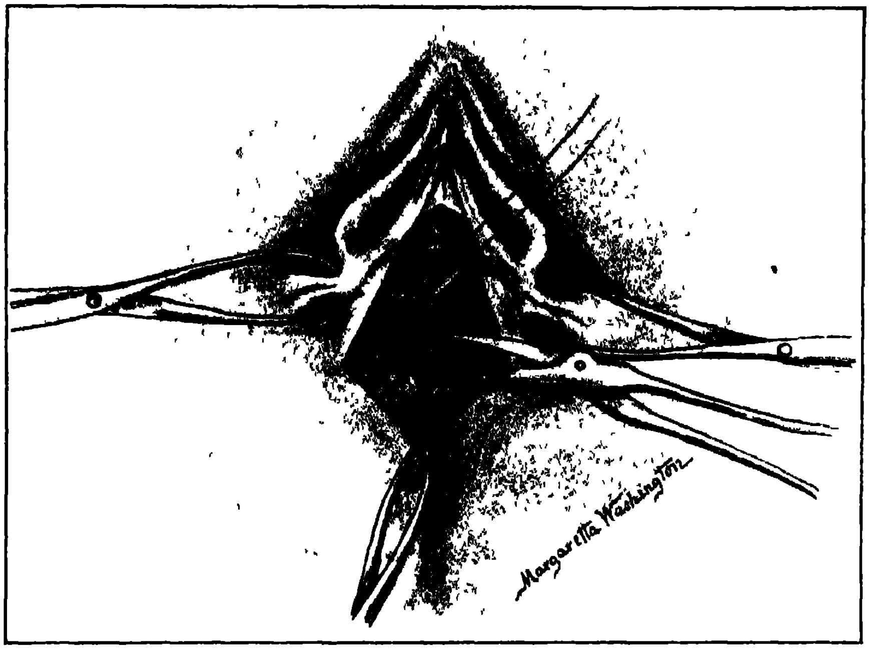

Fig. 197.—Dissecting and removing the third triangular flap from the crest of the rectocele to the base of the perineal ear

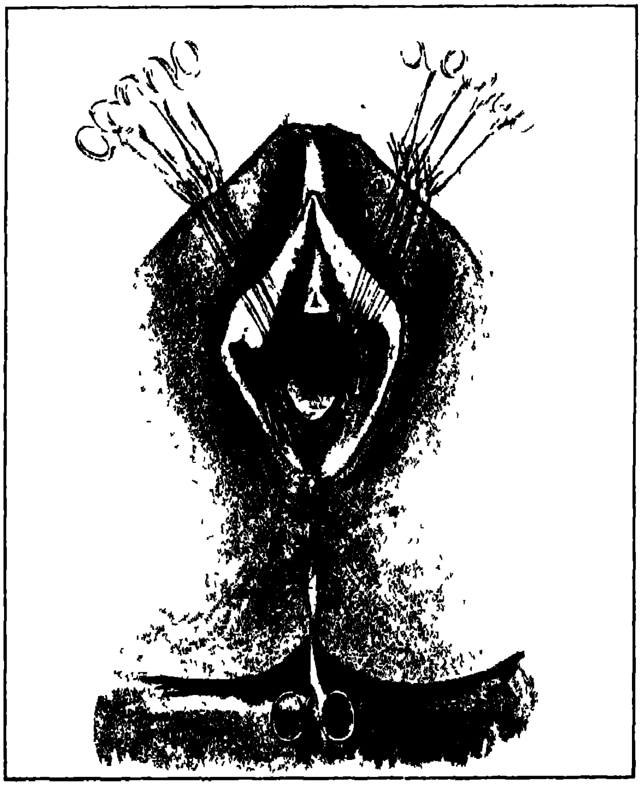

Fig. 198.—Sutures inserted and held by hemostats.

liable in the vagina. Firm and permanent apposition of the injured muscle can not always be obtained by it. In inserting the needle at the apex of the denudation the point should be directed downward and inward so that it emerges at the mid-line of the sulcus considerably below the point of insertion in the mucosa; it is reinserted and emerges opposite the point of first insertion Care should be taken to carry the needle point deep into the tissues laterally, by a turn of the wrist so as to catch the fibers of the torn and retracted levator ani muscle. Three to five sutures are usually required in each sulcus. After their insertion the "crown stitch" is placed with a large curved needle by transfixing the raw surface of the perineum proper on one side, about a quarter of an inch below the bullet forceps, the denuded crest of the rectocele just under the guide stitch and the opposite side of the denuded perineum If there has been a tear of the perineal center, the rest of the perineum below the crown stitch is united by interrupted sutures inserted with a large curved needle After all the sutures are united by perforated shot, the raw surfaces just above the crown suture (Fig. 199) are joined, thus forming a posterior commissure, a fossa navicularis, and approximating the labia. By this modification, the gaping vulva, which is the reproach and only disadvantage of an

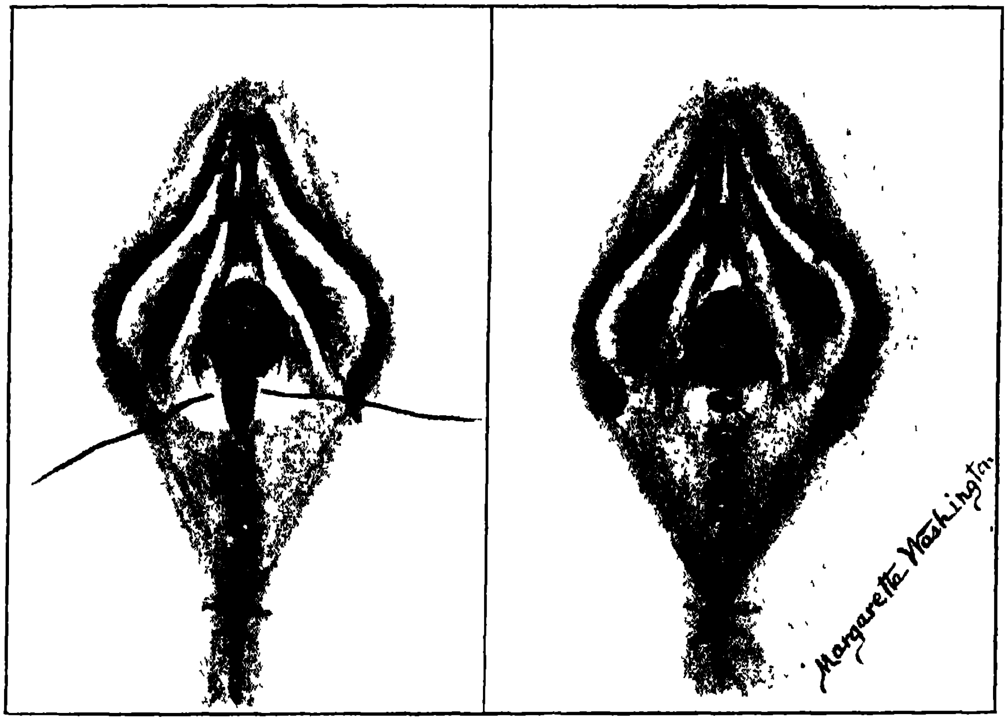

Fig 199 —Junction of the perineal sutures after the sulci sutures have been shotted

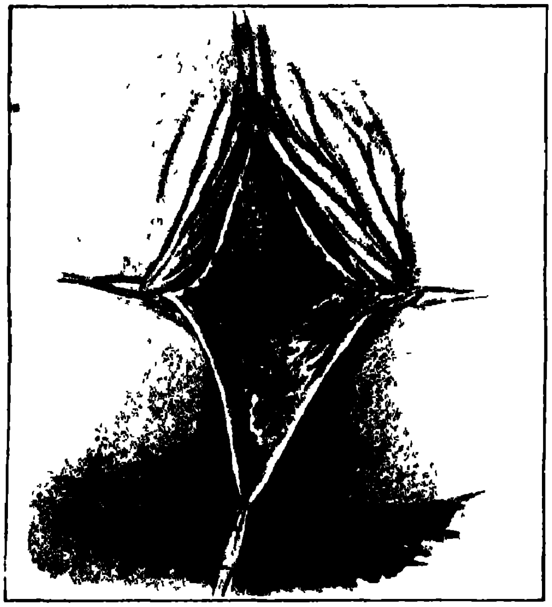

Fig 200.—The denudation for a Hegar's operation

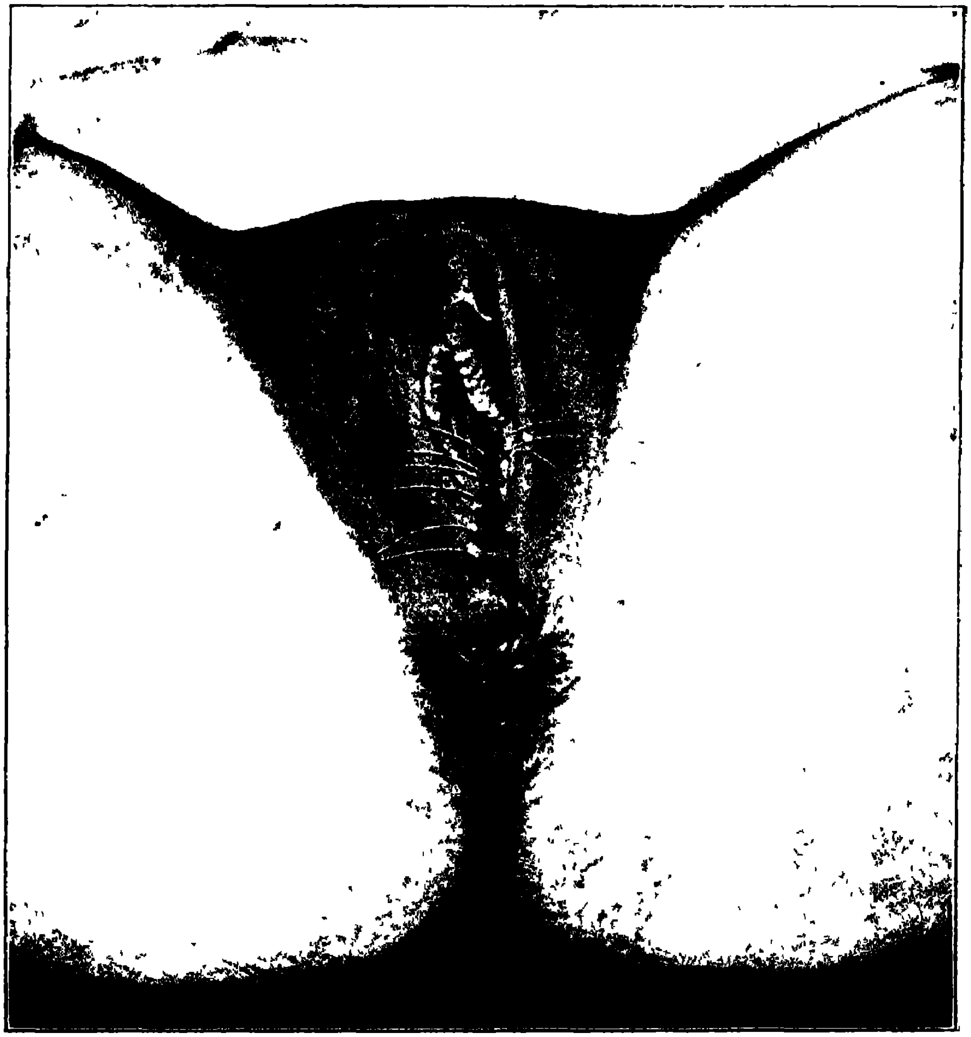

Fig 201—The perineal sutures in a Hegar's operation

Emmet's operation, is avoided. The Hegar's operation is performed as follows: The labia are pulled apart as in Emmet's operation by bullet forceps; a guide suture is placed as high in the middle line of the posterior vaginal wall as the denudation is to be carried, sometimes just below the cervix. As the forceps are pulled apart and the suture is lifted upward, a triangular space is displayed, which is marked out by a knife The flap is dissected off with scissors. The denuded surfaces are united by interrupted vaginal sutures inserted with a large curved needle. The first two or three upper sutures may be of catgut because there is no tension on them. The lower sutures should be of silkworm-gut A larger number of perineal sutures are required in the Hegar than in the Emmet operation.

The two most important *displacements of the vagina*, rectocele and cystocele, have been described. A complete inversion of the vagina usually accompanies a prolapse of the uterus or the descent of the cervix by supravaginal elongation. It will be considered, therefore, in connection with these displacements of the uterus In one case of the author's there was a complete inversion of the vagina after a panhysterectomy in an old woman who had before operation a remarkable elongation of the supravaginal portion of the cervix It was permanently cured by a Hegar's posterior colporrhaphy and an extensive anterior colporrhaphy with tier sutures, reducing the vagina to an extremely narrow canal. A complete excision of the inverted vagina in such a case, with entire closure of the canal above the urethral orifice, would perhaps have been the surer method, and would be the author's choice in another case.

New-growths of the Vagina.—Cysts are not uncommon. They are usually small, though they have reached the size of a fetal head. They are commonly single and are unilocular, but multiple cysts are reported, and septa or the remains of septa have been observed in their interior. The tumors are as a rule sessile, but if they attain a considerable size and grow toward the vulvar orifice from which they project they may be pedunculated The vaginal mucous membrane over them is normal and movable, but may become atrophic from pressure The rate of growth in a vaginal cyst is very slow; after reaching a moderate size it is apt to remain stationary. Its origin is often inexplicable, but it may be traced to glandular structures abnormally present in the vaginal mucous membrane from embryonal existence, to an accumulation of fluid in the remains of the Wolffian bodies, Gartner's ducts, in the lateral vaults of the vagina, to parovarian cysts growing downward and inward toward the base of the broad ligament, to epithelial structures implanted in the vaginal

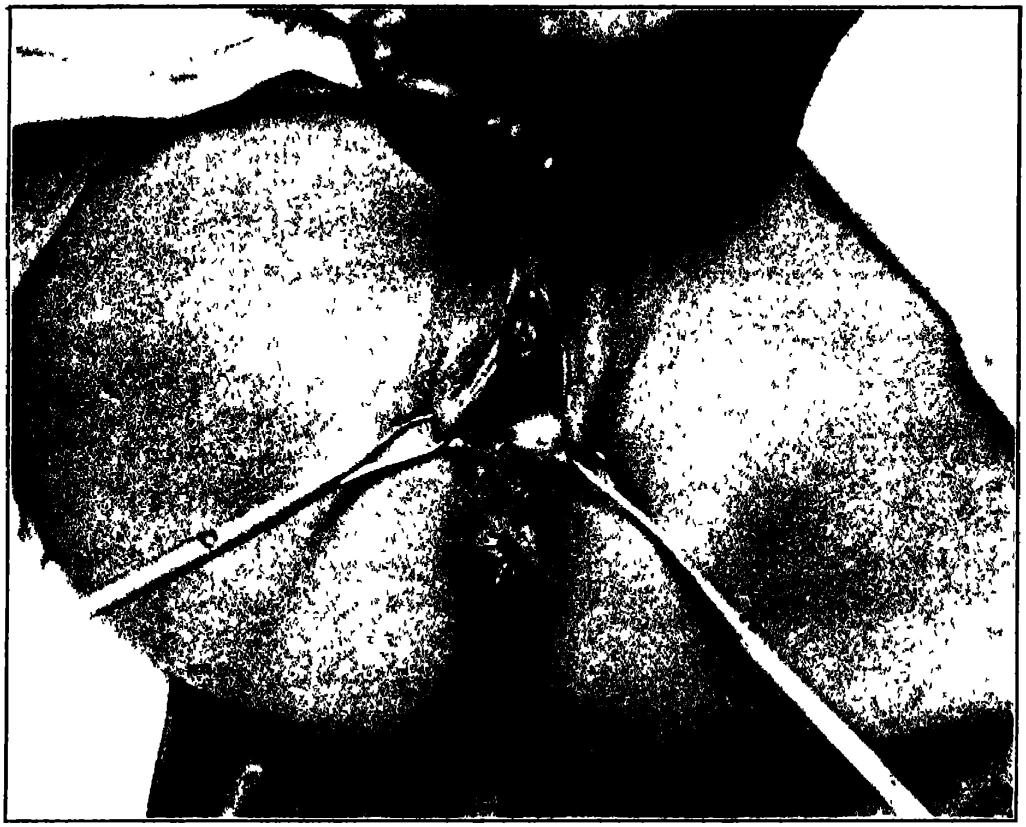

Fig 202 —Vaginal cyst.

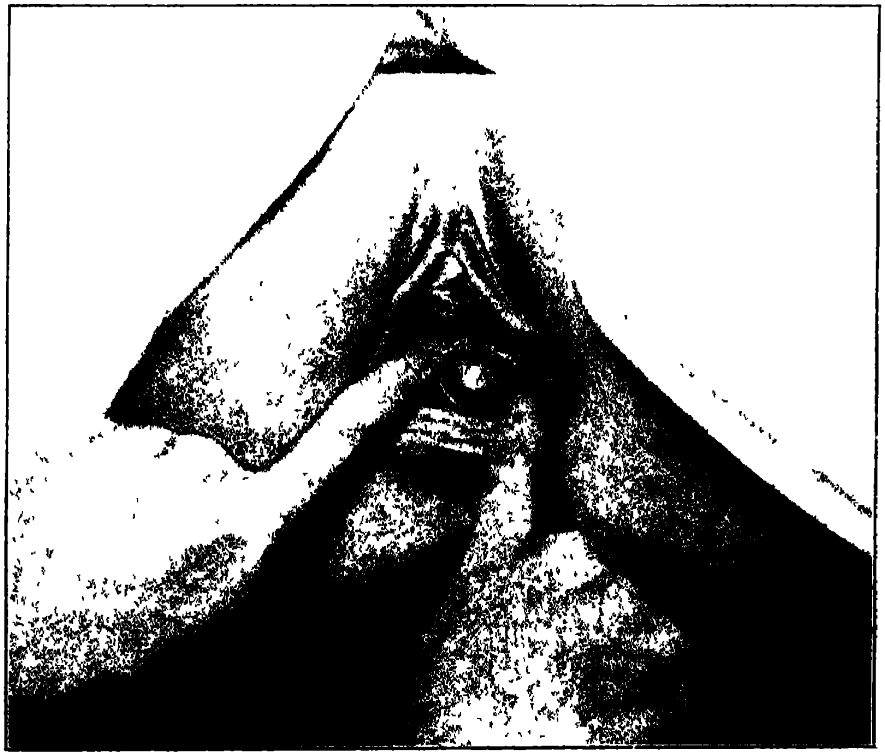

Fig. 203.—Vaginal cyst.

wall by traumatism in childbirth or by an operation ; to a unilateral development of the vagina from one Muller's duct while the other one produces a blind tube of narrow caliber alongside of it, and to an encysted interstitial hemorrhage. The cyst may be a dermoid, which is occasionally found between the rectum and vagina, or a lymph-cyst, which occurs anywhere under mucous or cutaneous surfaces. The investing membrane of a vaginal cyst is fibrous in character, often containing unstriped muscle-fibers. The interior of the cyst is lined with epithelium of various kinds,—squamous, cuboidal, and columnar,—the three types being observed sometimes in a single tumor Ordinarily the cyst causes no symptoms, unless its size is greater than common, when it may produce irritation of the vagina, leukorrhea, a sense of weight and bearing down, dysuria, and dyspareunia.

The *treatment* of a vaginal cyst is its evacuation and its enucleation, if possible. In order to facilitate the latter procedure, it has been suggested to fill the evacuated tumor with melted paraffin (Pozzi), which is solidified by the application of ice Schroeder proposed the removal of as much of the tumor as could easily be cut away, and the junction of the lining membrane of the remainder of the cyst with the vaginal mucous membrane, the former being exfoliated and replaced by vaginal epithelium or converted eventually into normal vaginal mucous membrane. If the tumor is enucleated easily and its bed is shallow, the vaginal mucous membrane is united over it by sutures after whatever hemostasis is required If the cavity left by the tumor is of considerable depth, it should be packed with gauze until it is obliterated by granulation.

Fibromata of the vagina are rare.[1] They are usually of small size and situated on the anterior vaginal wall In the posterior vaginal vault the tumor may be an adenomyoma, derived from a Wolffian body. Their rate of growth is very slow, and after reaching a moderate size they remain stationary. A fibroid of the vagina, however, weighing two pounds has been reported They are sessile in form, as a rule. Histologically they are like fibroids of the uterus, but contain less muscular tissue.

They may give rise to no symptoms at all if moderate in size, but had best be removed on account of the bare possibility of malignant degeneration. The enucleation of the tumor presents no difficulties, and its removal is all the easier if it is pedunculated, as it sometimes is (fibroid polyp of the vagina), the pedicle being transfixed and ligated with catgut and the polyp then cut away.

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[1] Smith reported to the Chicago Gynecological Society, November, 1901, 100 cases from literature and one of his own (" Amer Jour. Obstet ," Feb , 1902)

Sarcoma of the vagina is rare. It occurs at any age, but is usually found in women under forty. It has appeared in early infancy and childhood and may be congenital. In children the tumor springs from the anterior vaginal wall, is bright or dark red in color, and polypoid in form The bladder is soon involved, and secondary symptoms due to infection and pressure upon the

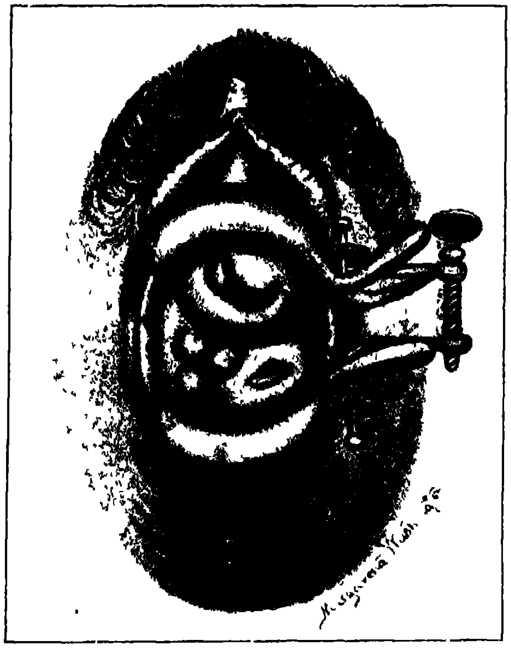

Fig 204—Fibromyoma of posterior vaginal vault

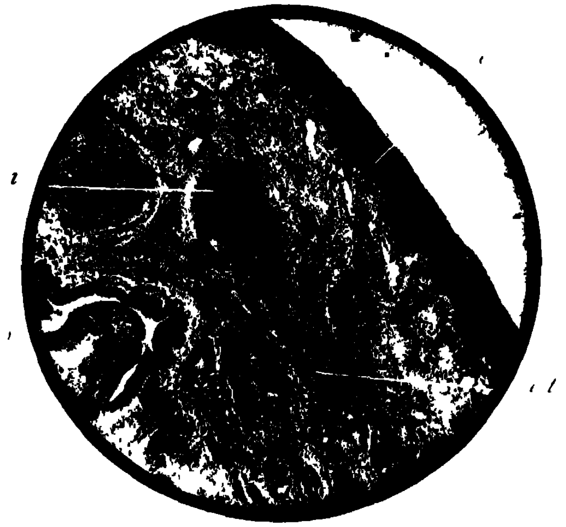

Fig 205.—Fibroid polyp from vagina: *e*, Squamous epithelium, *f t*, fibrous tissue, *v*, blood-vessel; *i*, area of inflammation and round-cell infiltration (McConnell and J C Hirst)

urinary tract appear. In adults the tumor is rounded in form, with a broad base. It is usually found upon the anterior vaginal wall and at its lower third. The mucous membrane over the tumor is preserved until comparatively late in the history of the growth, when ulceration occurs. Occasionally there is a diffuse sarcomatous infiltration of the submucous connective tissue instead of a circumscribed tumor. The urinary tract is apt to be invaded, metastases to distant organs are the rule, and recurrence of the tumor if it is extirpated is almost invariable.

Carcinoma of the vagina is usually an extension of the same disease from the cervix uteri. It occurs also as a metastasis from the ovary and as an implantation metastasis from the corpus uteri The author has seen a carcinomatous tumor projecting from the posterior vaginal wall that originated in a malignant tubular adenoma of the rectal mucous membrane growing forward toward and into the vagina and scarcely encroaching upon the rectum at all Primary carcinoma of the vagina is rare.[1] It is almost always an epithelioma. Its favorite seat is the posterior vaginal vault. The etiology is obscure. The irritation from the prolonged use of a pessary may be accountable for it Neugebauer has collected eight such cases. The growth projects as an excrescence from the vaginal mucous membrane with an ulcerated

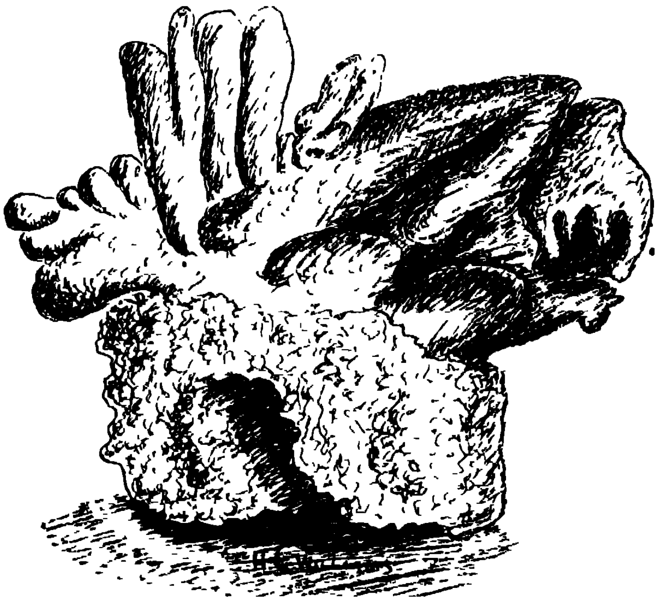

Fig 206 —Malignant tubular adenoma of rectum projecting into the vagina and breaking down

surface, surrounded by an infiltrated area in which secondary nodules soon appear. Carcinomatous infiltration of the vaginal mucous membrane may be seen occasionally encircling the canal in the form of a ring.

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[1] One hundred and fifty-five cases have been collected ("Jahresbericht u d Fortschr a d Gebiet d Geb u. Gyn.," vol xv; also R Williams, "N. Y Med Record," No 30, 1902).

It may require a microscopical examination to differentiate sarcoma from a fibroma and carcinoma from tuberculosis, condylomata and syphilis.

The *treatment* of sarcoma and carcinoma of the vagina is palliative and radical. The former is the only justifiable treatment if the growth is secondary or metastatic, if it is too extensive for complete removal, or has already produced metastases elsewhere. The treatment in such cases has for its object a euthanasia. The patient is made much less offensive to herself and to others by deodorant douches, and the free use of morphia in increasing doses dulls the pain. The radical treatment involves the complete extirpation of the growth by the excision of its base and of considerable healthy tissue beneath and around it. The thermo-cautery knife should be extensively employed to prevent implantation metastasis and to destroy outlying nests of carcinomatous cells. The complete extirpation of the vagina has been proposed for malignant disease and tuberculosis of its walls. In the hands of some German surgeons the operation has proved successful and not especially difficult. A circular incision is made around the base of the hymen and the vagina is stripped loose from its attachments by a blunt and almost bloodless dissection to the uterus, which must be removed by a vaginal hysterectomy. The site of the vagina is obliterated by the agglutination of raw and granulated surfaces. It was found necessary in a few cases to incise the perineum to and around the anus in order to obtain room for the excision of extensively infiltrated vaginal walls and for the vaginal hysterectomy. The control of the hemorrhage from the hemorrhoidal vessels proved very difficult.

Pointed Condylomata of the vagina are rare. Single spurs springing from the vaginal mucous membrane associated with masses of venereal warts on the vulva are common, but the author has only seen a single case in which there was a large mass of venereal warts growing from the vaginal vaults and the cervix. The appearance is quite distinctive and differs from that of a cauliflower epithelioma enough to make a differential diagnosis on sight possible. The color is a light pink, contrasting with the deep red, ulcerated appearance of an epithelioma There is no ulceration of the condylomata. The epithelium covering the papillomatous growth is normal. The mucous membrane around the pedicles is normal. There is no infiltration. The microscopical examination makes the differential diagnosis conclusive.

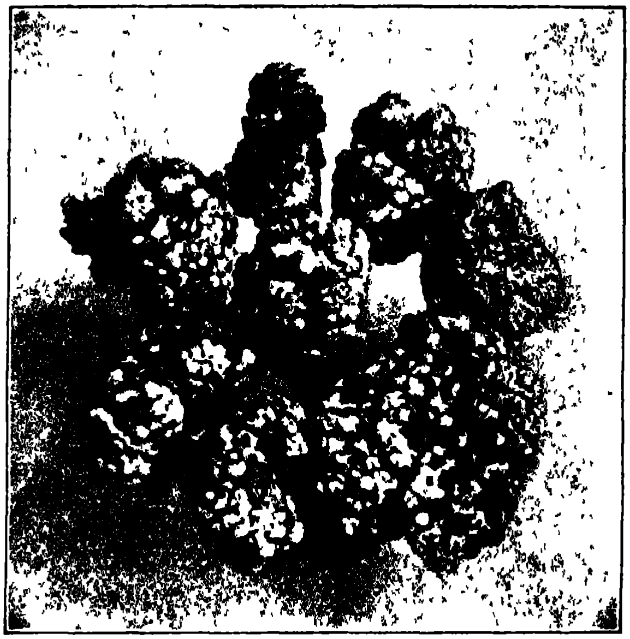

Fig 207.—Masses of pointed condylomata removed from the vaginal vaults and the cervix

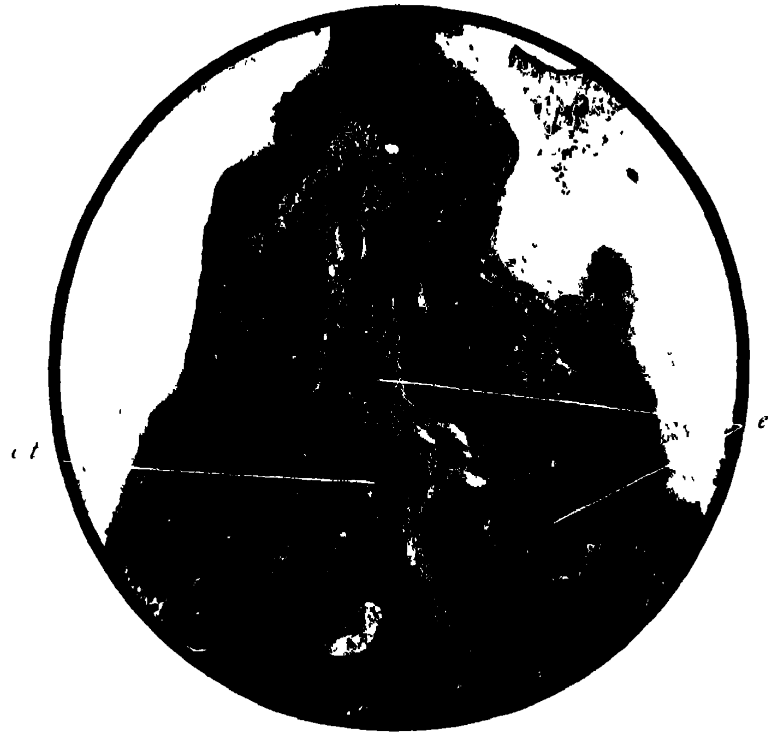

Fig. 208.—Venereal wart from cervix: e, Hypertrophied squamous epithelium; c t, connective tissue (McConnell and J. C. Hirst).

The **treatment** of condylomata in the vagina is their excision. It is necessary to transfix the healthy mucous membrane around their bases with a needle and catgut and to tie the pedicle made by pulling upon the growth. Without this precaution there is profuse hemorrhage.

Foreign Bodies in the Vagina.—A long and varied catalogue of foreign bodies found in the vagina could be prepared from the reported cases.[1] Needles, hairpins, spools, spoons, pine cones, pipe bowls, and pieces of wood are a few examples. In an insane patient in the Philadelphia Hospital a medicine cup was found in the vagina. In a dispensary patient of the Howard Hospital a piece of glass was found embedded in the vaginal wall under the mucous membrane. It had been there for several years, since a vaginal douche administered in Italy during which the glass nozzle of the syringe was broken. The commonest foreign body in the vagina is a neglected pessary. The author was asked to see an old lady sixty years of age with a foul-smelling bloody discharge, naturally suggesting cancer. A pessary was found in the vagina, much to the patient's surprise. She could not remember when it had been inserted, but was certain it was more than twenty years before The removal of the pessary and a daily douche for a week or two cured the vaginal ulceration.

The most dangerous form of pessary to leave in the vagina a long time without removal is the ring pessary of some hard material, such as hard rubber. It is very likely to ulcerate into the bladder and to embed itself deeply in the vaginal vault In a patient in the Philadelphia Hospital there was an opening in the bladder into which three fingers could be placed and the ring pessary of hard rubber was so deeply embedded and overgrown by exuberant granulation tissue that it could only be removed by clipping off with bone forceps the segment exposed in the vesicovaginal fistula. Pulling on a free end after removing about an inch, and thus rotating the pessary, another segment was exposed and cut off, and thus the whole instrument was eventually removed in three or four fragments

After the removal of the foreign body it may be necessary to treat extensive ulceration, fistulæ into the bladder and rectum, and general sepsis Fatal results are recorded from peritonitis, general sepsis, and obstruction of the bowel.

Fecal Fistulæ in the Vagina.—The commonest fecal fistula in the vagina is a rectovaginal fistula the result of an imperfectly healed complete tear of the perineum. Occasionally the rectovaginal septum is perforated in labor without injury to the perineum. A fetal extremity has prolapsed through the anus before the birth of the child. Ulcerative processes and infection in the puerperium with suppuration of the rectovaginal septum have resulted in the formation of a rectovaginal fistula. The same result has followed the ulceration associated with adynamic and infectious fevers.

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[1] Neugebauer, "Archiv f. Gyn," Bd xliii

Other **causes** of a fecal fistula in the vagina are perforation of the posterior vaginal wall and the bowel by instruments used in labor or to induce abortion ; falls upon some object, like a broom handle or the small bough of a tree, which enters the vagina ; abscesses in the tube or in Douglas's pouch which open into the vagina and into the bowel ; prolapse of a coil of intestine through a laceration of the vaginal vault in labor, its incarceration, and gangrene ; tight packing of the pelvis with gauze, or the use of a drainage-tube after an operation for pelvic inflammation and suppuration, which causes ulceration of a bowel-wall already diseased ; and wounds of the bowel in vaginal operations for hysterectomy, the removal of the uterine appendages, and the evacuation of pelvic abscesses. The ulceration of a rodent ulcer, tertiary syphilis, tuberculosis and cancer, and that caused by the prolonged retention of a foreign body, is a cause of fecal fistula in the vagina.

The **symptom** of a fecal fistula in the vagina is the involuntary escape of gas and feces from the vulva. On inspection a small projection of granulation tissue is observed a short distance within the vaginal entrance, usually to one side of the median line, often edematous and covered with a purulent discharge. Bubbles of gas may form over the vaginal orifice of the fistula during the examination. There is usually a brawny infiltration along the fistulous tract. By passing a surgeon's probe into the fistula from the vagina and inserting a forefinger into the rectum the communication between the two canals is readily demonstrated. If the fistula is a large one, it may be possible to see the rectal mucous membrane through it, and to observe fecal masses of considerable size passing into the vagina. The finger inserted into the rectum may be passed into the vagina or may be seen in the rectum from the vagina.

If the fecal fistula has another origin than an imperfectly healed perineal laceration in labor, it may be situated in the vaginal vaults, almost always in the posterior, although two cases are recorded in the anterior vault. It is important to determine whether the communication is between the vagina and rectum or between the vagina and the small intestine. This is done by probing the fistula and inserting a forefinger in the rectum as high as possible, by the use of the proctoscope, which enables one to see the point of the probe emerging into the bowel anywhere below the sigmoid flexure, or by noting the character of the feces discharged. It is also important to note whether all the feces pass from the fistula (anus præternaturalis vaginalis) or whether a part is discharged by the anus.

The **treatment** of a fecal fistula in the vagina differs with its situation and cause. A persistent rectovaginal fistula, the result of an imperfectly healed or badly repaired perineal tear, is easily cured. A grooved director is passed from the vagina into the bowel and out through the anus; the perineum is divided with a knife or scissors, the fistulous tract is scraped with a sharp curet, or denuded with scissors of all granulation tissue, and the wound is united as in the secondary operation for a sphincter tear which has been unsuccessfully repaired (p. 175).

A fistula in the vault of the vagina is more difficult to deal with. Time should be allowed for its spontaneous closure, which occurs quite often. Meanwhile frequent douching of the vagina is required. If a persistent fistula communicates with the rectum, the fistulous tract may be dissected out and the hole in the bowel sutured after its edges are freshened The vaginal wound is partly closed by sutures and is drained by a narrow strip of gauze. Even if the sutures in the bowel give way the fistula will probably be diminished in size, may close spontaneously, or at any rate is more easily obliterated by a second operation than by the first If the plastic operations prove a failure, the proposal of P. Segond may be adopted A transverse incision is made in the posterior vaginal wall above the sphincter; the rectum is cut across and exsected up to the fistula The rectum above this point is brought down and sutured to the remnant of the bowel just above the sphincter. Segond secured a successful result by this method.[1] If the fistula communicates with the small bowel, a plastic operation as described for a rectal fistula may be attempted If it fail, a resection and anastomosis of the gut may be tried by the vaginal or abdominal route, but the operation presents formidable difficulties on account of the extensive adhesions and distorted relations of the intestinal coils. If th fistula is large and there is a vaginal anus by which all the feces escape, an attempt at closure may result in obstruction. Before resorting to operation plenty of time should be allowed for a spontaneous closure, which is not unlikely to occur

The fecal fistulæ in the vagina, the result of rodent ulcer, tertiary syphilis, tuberculosis, and cancer, are usually incurable. An attempt to close them by an operation leaves a larger opening than before.

Vaginismus.—By vaginismus is meant a spasmodic contraction of the bulbocavernosus and of the levator ani muscles, preventing coitus or making impossible the insertion of the tip of the forefinger in an attempted examination. The condition is usually not detected until after marriage, when coitus is found to be impossible. A feeling of delicacy prevents the woman from seeking medical advice, so that as a rule months or years elapse after the first futile attempt at intercourse before the physician has an opportunity to examine the patient.[1]

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[1] "Ann. de Gyn. et d'Obstet," vol xliv, p. 1.

In the examination of some cases no evidence of spasm in the constrictor muscles of the vagina appears. One or two fingers are easily inserted in the vagina, and a bivalve speculum may be opened its full width. It is only the nervous excitation of the attempted intercourse that excites the spasm. In other cases it is impossible to touch the external genitalia without producing the most violent contraction, the most marked evidences of acute pain and nervous excitement. The buttocks are lifted off the examining table, the thighs are forcibly approximated, and the patient resists the attempted examination violently If an examination is made in the first few months after marriage, the results of futile attempts at intercourse are seen in abrasions of the inner surfaces of the labia and on the free edges of the hymen, the latter being the seat often of exuberant granulations that bleed easily on the least touch. Ordinarily there is no disease of the genitalia, the affection is a distinct neurosis. It is therefore most commonly seen in neurasthenic and hysterical subjects. But any of the painful or irritating affections of the vulva may have vaginismus as a secondary result, such as vulvitis, kraurosis and pruritus vulvæ, or urethral caruncle An inflammatory disease of the uterine appendages may make coitus so painful that a dread of it excites a spasm of the muscles. Vaginismus, therefore, may develop in women who have been married for years and have borne children.

Before attempting to treat vaginismus, a careful examination of the genitalia must be made; if necessary, under anesthesia. If it depends upon some source of local irritation, its cure is hopeless unless the cause is removed. Vulvitis, pruritus, kraurosis, a caruncle, each demands its appropriate treatment. Inflammatory diseases of the uterine appendages may require surgical intervention or local applications. Ordinarily, however, no local cause is discoverable, and the treatment is directed toward overcoming the spasmodic contraction of the muscles around the vulvar and vaginal orifices. If there are painful abrasions the result of unsuccessful attempts at intercourse, the treatment of the vaginismus must be postponed until they are healed, for if the physician inflicts pain upon the patient she rarely has the resolution to persist in an effort to be cured. The first requisite for success is to impress the patient with the belief that a bougie can be inserted in the vagina without pain. A pledget of cotton soaked in a 4 per cent. solution of cocain is gently placed in the vulvar orifice and allowed to remain five minutes. Then a Hegar's bougie of small size, no larger than one's forefinger, warmed and well oiled, is cautiously and slowly passed into the vagina. Nothing more should be attempted on the first visit. Two days later, with the same precautions, a larger instrument is passed, and so on until the patient's confidence is gained and

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[1] In one of the author's patients the condition had persisted eighteen months; in another, eight years; and in another, twelve years.

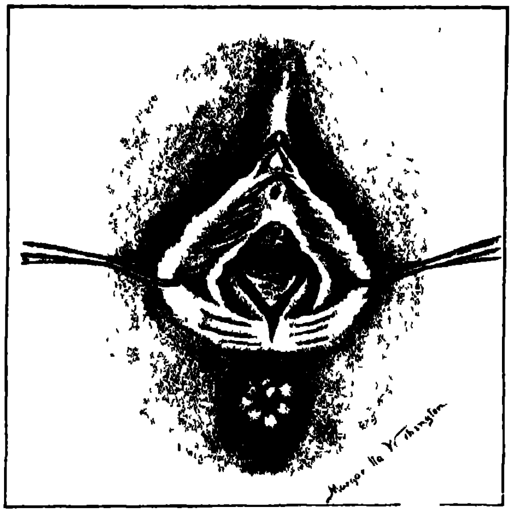

Fig. 209.—Y-shaped incision through the levator ani muscles and the perineum for vaginismus.

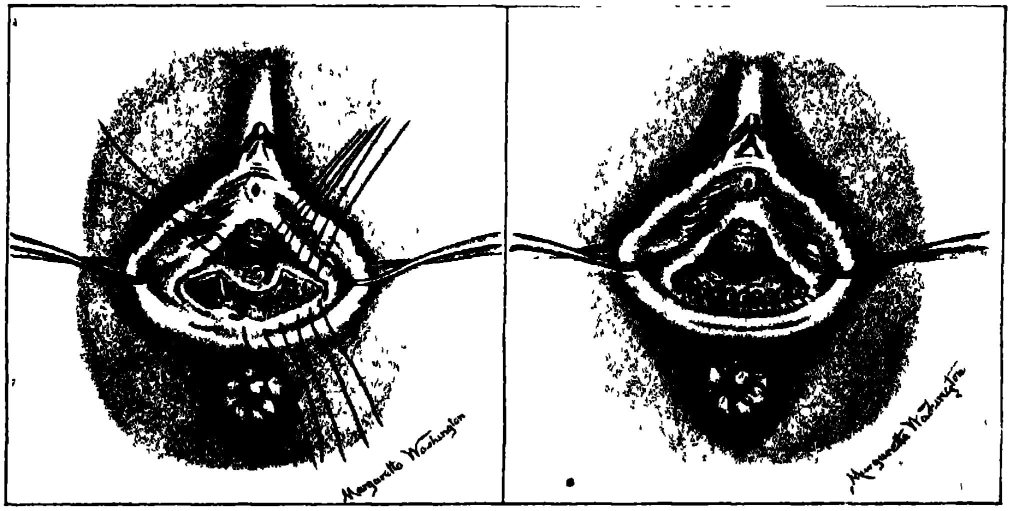

Fig. 210.—Insertion of the sutures in the operation for vaginismus.

she is convinced that the insertion of the instrument is not difficult. She is then provided with a set of graduated bougies up to an inch and a half in diameter,[1] with instructions to use them herself daily, progressing as fast as possible in the use of larger sizes without inflicting pain upon herself, and allowing the instrument to remain in the vagina for an hour at a time while she rests in bed. The author keeps a set of these bougies to lend to patients with vaginismus. It is a frequent experience to have them returned triumphantly in about six weeks with the statement that they are no longer needed.

If the case is of long duration or is very aggravated in degree, nothing as a rule is to be hoped from gradual dilatation. It is necessary to split the perineum half-way to the anus and to make two deep incisions in the vaginal sulci, an inch or more in depth and extending more than an inch up the vaginal walls, imitating the sulci tears of a labor. A transverse row of sutures is then inserted from above downward, uniting the vaginal mucous membrane to the skin of the perineum. The result is a gaping vulvar orifice and vaginal introitus, and an abrogation of the contractile power of the bulbocavernosus and to a lesser degree of the levator ani muscle. The author has uniformly cured in this way the worst cases of vaginismus.

The statement is copied from one book to another that a spasmodic contraction of the levator ani in coitus is responsible for that awkward accident, *penis captivus*, but no authentic cases are given, and the author confesses to a skepticism as to its possibility

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[1] Hegar's glass bougies for dilatation of the cervix in pregnancy and labor are reasonable in price and answer the purpose

PART V.

INJURIES AND DISEASES OF THE CERVIX.

THE cervix uteri, or neck of the uterus, extends from the level of the internal to the external os, or from the inferior border of the lower uterine segment to the external os. One-third of the cervix, the vaginal portion, projects like a nipple into the vaginal vault. The vaginal portion of the cervix is divided into anterior and posterior lips by the external os, which is usually a transverse slit or oval opening. The posterior lip is the longer of the two.

The vaginal portion of the cervix, or all that portion of the cervix below the attachment of the vaginal mucous membrane, is conical in shape, resting with the external os against the posterior wall of the vagina, which is thickened at this point (cervical pillow). The anterior lip is supported by the posterior wall of the vagina, and the posterior lip is in immediate contact with the mucous membrane of the posterior vaginal vault

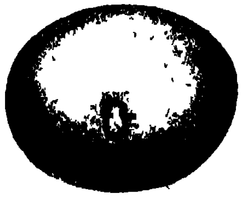


Fig 211.

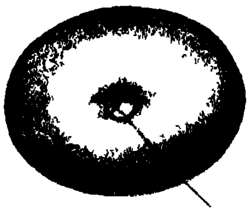


Fig 212

Figs 211, 212 —External os uteri of nulliparæ

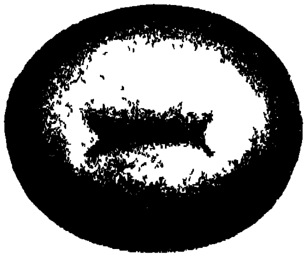


Fig 213

Fig 213 —External os uteri of a multipara

The external os in a nulliparous woman is sometimes circular, but more frequently elliptical, with the long diameter of the opening transversely. Projecting from the external os there is usually a plug of thick, tenacious, clear mucus, the mucous plug of the cervix. All that part of the cervix above the mucous membrane of the vagina, to the isthmus uteri, the lower uterine segment, or the level of the internal os, is called the supravaginal portion of the cervix. It is longer anteriorly than posteriorly, and is firmly connected with the vaginal wall by muscular, elastic, and connective tissue. Above the attachment of the vagina anteriorly the cervix is in part attached to the bladder and in part is covered by the peritoneum lining the vesico-uterine pouch, which is rather loosely bound to it by connective and elastic tissue. Posteriorly the cervix above the vaginal wall is covered by peritoneum, firmly attached to it.

In a longitudinal section the cervix is divided into two parts —the muscular portion, or body, and the canal The former has the same unstriped muscular fibers as the corpus uteri, but the individual fibers are smaller, less compactly arranged, and there is an abundance of connective tissue. There are three layers of

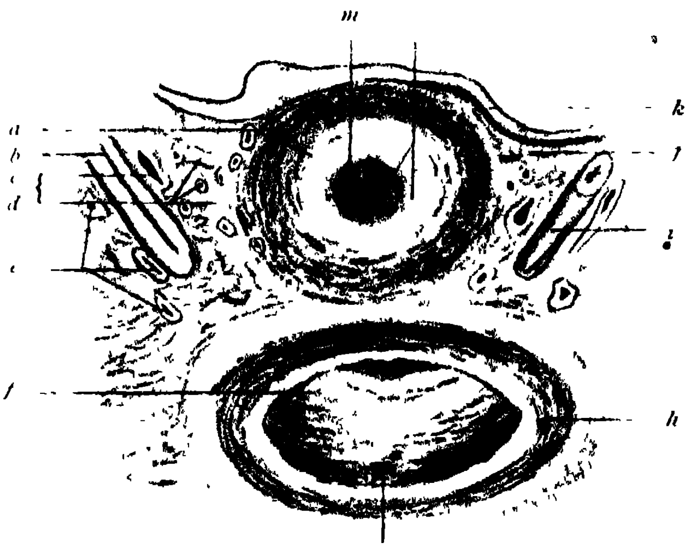


Fig 214.—Transverse section of the cervix uteri: *a*, Cervical muscularis, *b*, right ureter, *c*, *d*, uterovaginal venous plexus; *e*, vesicovaginal plexus, *f*, orifice of right ureter; *g*, internal urethral orifice, *h*, bladder-wall; *i*, left ureter, *j*, parametrium; *k*, serous coat, *l*, mucous coat, *m*, cervical glands (Waldeyer)

muscle-fibers in the cervix—an outer and an inner longitudinal layer and a median circular layer. The latter is much the thickest and strongest. The cervical canal is spindle-shaped, contracted above and below at the internal and external os The former is the narrowest portion of the uterine cavity, the contraction extending a length of 4 to 5 millimeters. The broadest part of the cervical canal is its middle

The mucous membrane of the cervical canal is sharply differentiated from that of the vaginal portion below and that of the uterine cavity above. It is pale grayish-red, soft, and from 1 to 2 millimeters thick. There is no submucosa. The mucous membrane rests directly upon the muscle. The dividing line between the cylindrical epithelium of the canal and the squamous epithelium of the vaginal portion is normally the external os, but the former may extend far out upon the vaginal portion (erosion) and

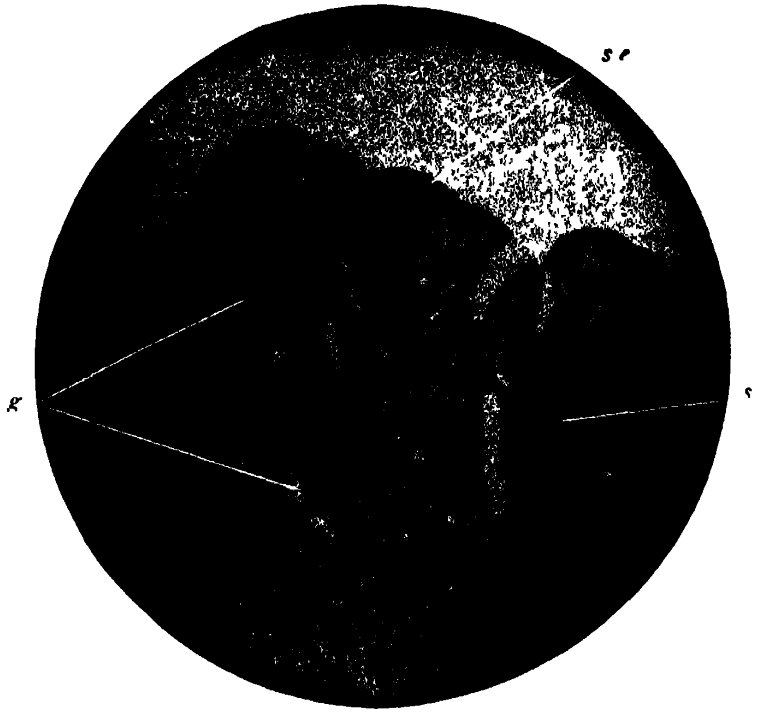


Fig. 215.—Normal endometrium of cervix: *s*, Stroma; *s.e*, surface columnar epithelium; *g*, glands (McConnell and J. C Hirst)

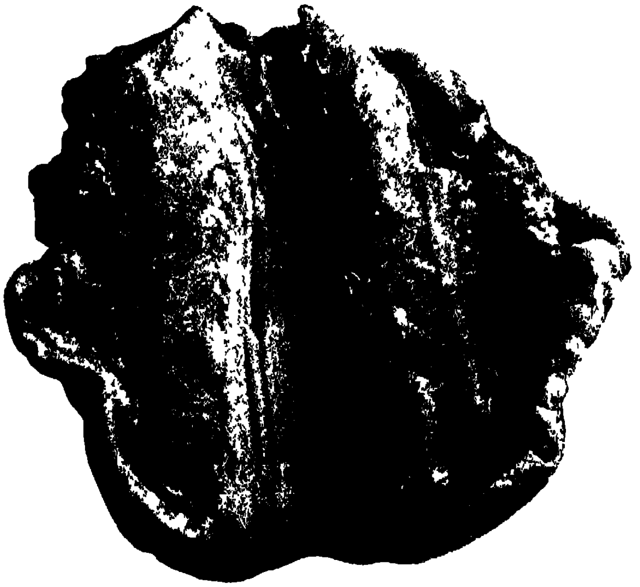


Fig. 216.—Longitudinal section of cervix of a nulliparous woman, showing palmæ plicatæ.

the latter may extend high into the cervical canal, even into the uterine cavity.

The ciliated epithelial cells are long and slender. The nuclei are long and lie mainly toward the bases of the cells. The mucous membrane is thicker than that of the uterine cavity, more sharply divided from the musculature under it, possessing more connective tissue and fewer round-cells. On the anterior and posterior walls of the canal the mucous membrane is thrown into transverse folds (*palmæ plicatæ* or *arbor vitæ*), making a figure like the ribs of a leaf. The glands of the cervical mucous membrane are tubular, with many lateral processes and projections. They open in the creases of the palmæ plicatæ, secreting the thick, tenacious mucus which normally fills the cervical canal and may project from the external os.

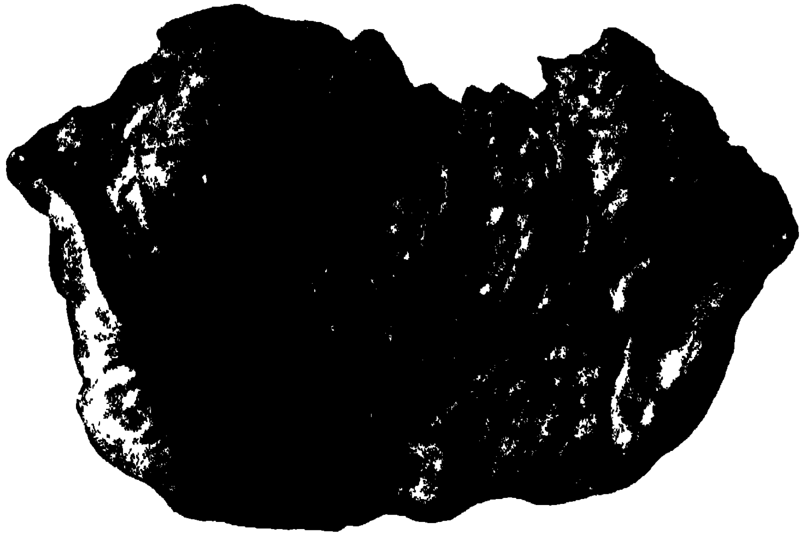


Fig. 217.—Longitudinal section of cervix of a multipara, showing obliteration of the palmæ plicatæ.

The cilia of the cervical epithelium lash toward the external os, and those of the glands from their bases toward their orifices.

Injuries of the cervix are possible as the result of attempts to induce abortion, from the use of instruments to dilate the cervical canal, in consequence of the extraction of a tumor from the uterine cavity, but the injuries of labor are overwhelmingly more numerous than any others. They may take one of three forms: longitudinal lacerations, circular lacerations, and abrasions.

Longitudinal lacerations are usually bilateral, more or less completely dividing the anterior and posterior lips. From the weight of the uterus and the drag of the vaginal walls at their attachments anteriorly and posteriorly, the two lips of the cervix are pushed and pulled apart until eventually they diverge from one another like the ends of a split stalk of celery. This condition is called *ectropion or eversion.*

Frequently the anterior lip is more everted than the posterior

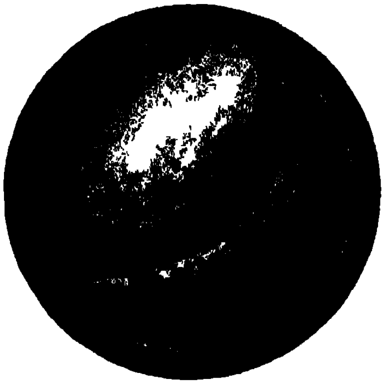


Fig. 218.—Incomplete laceration and crescentic shape of os.

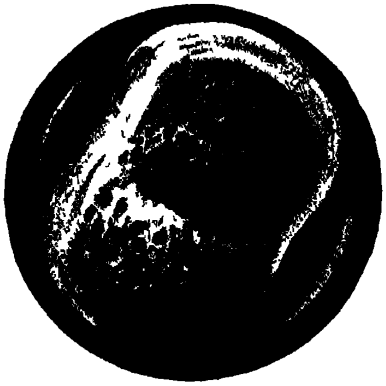


Fig. 219.—Bilateral laceration and eversion.

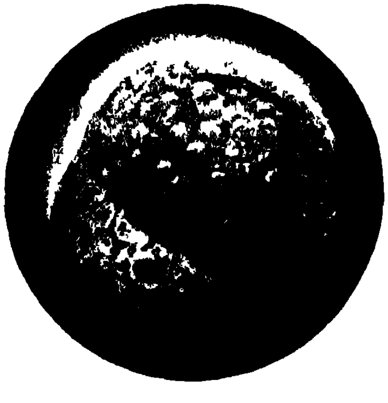


Fig. 220.—Bilateral laceration and unequal eversion of lips.

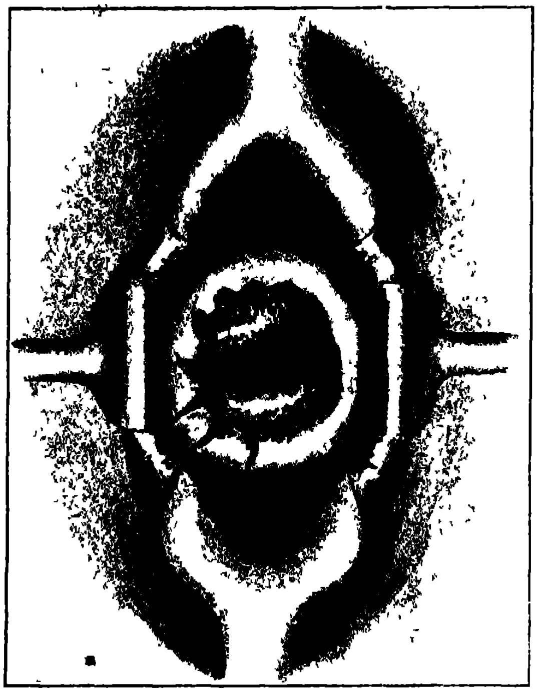
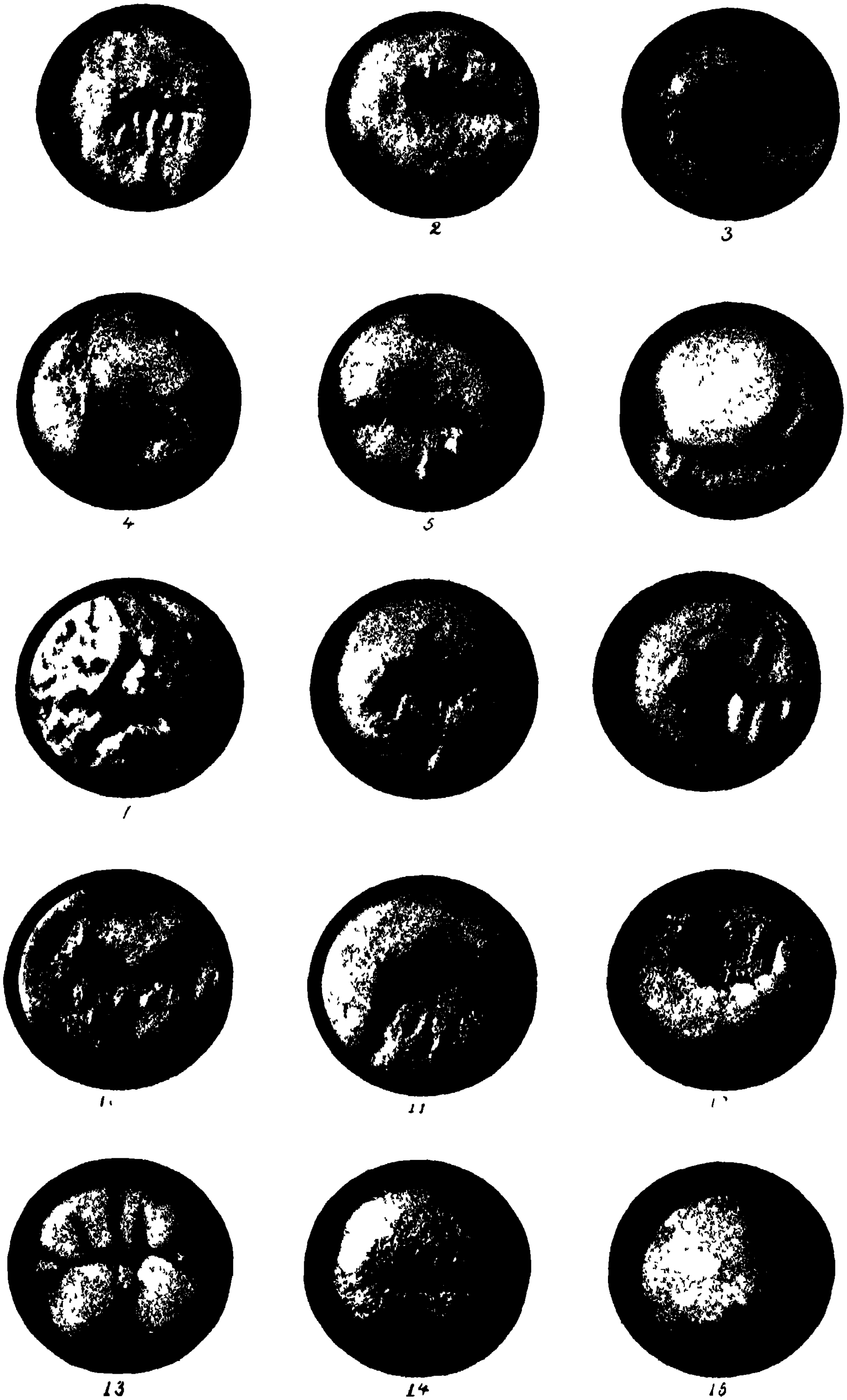


Fig. 221.—Bilateral laceration and erosion.

because of the direction of the uterine axis from before backward and from above downward, which imposes the greatest weight on the anterior lip, and because of the lower attachment of the vaginal wall to this lip, which pulls it forward. The result of this asymmetrical eversion of the lips is to give a crescentic form

PLATE 6.



Injuries and erosion of the cervix : 1–1 , Types of erosion and cicatricial infiltration of the cervix ; 15, conical cervix and pinhole os.

to the os uteri, with the concavity directed forward, and to give to the cervix and os the shape of a shark's mouth.

The eversion of the lips exposes the deep red mucous membrane of the cervical canal, which, undergoing hyperplasia from irritation, may encroach upon the light pink squamous epithelium of the vaginal portion of the cervix, giving to the latter a raw, inflamed, angry appearance. This condition is called *erosion of the cervix* (page 214).

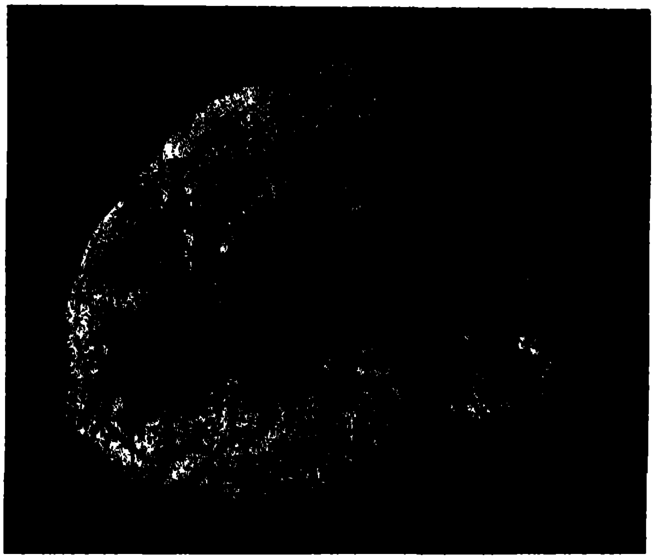


Fig. 222.—Bilateral laceration and eversion.

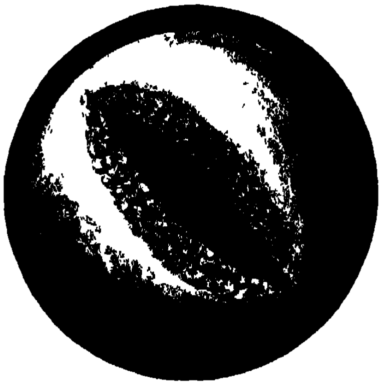


Fig. 223.—Incomplete bilateral laceration

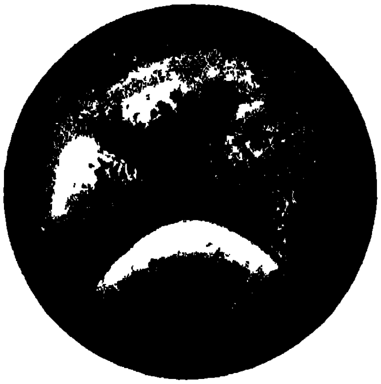


Fig. 224.—Stellate laceration

If the tear of the cervix is unilateral, the sound side acts as a splint and prevents ectropion and erosion.

The laceration may divide the cervix anteriorly or posteriorly as well as laterally, thus having three or more arms. Such a tear is called *stellate*.

The lateral lacerations may extend into the vaginal vaults dividing the vaginal and the supravaginal portions of the cervix. Such an injury is complicated by cicatrices fixing the cervix to the vaginal vaults, or by fibrous bands joining the cervix to the vault of the vagina. All extensive injuries of the cervix are likely to be followed by cicatricial infiltration which more or less completely displaces the normal myometrium, replacing the elastic cervical muscle by scar-tissue as dense and hard as cartilage. The mucous membrane of the canal is altered in time, the columnar epithelium being replaced by squamous epithelium, the palmæ plicatæ being obliterated and the mouths of the cervical glands obstructed so that the cervix is studded with little retention cysts that appear on the surface of the vaginal portion as small vesicles discharging, when pricked, the characteristic clear viscid mucus of the cervix (glands or ovules of Naboth).[1]

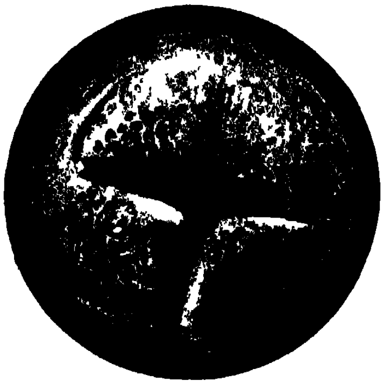


Fig. 225 —Multiple incomplete lacerations.

In consequence of the irritation of the cervix from cicatricial infiltration, the obstruction of the glands, and possibly its fixation by adhesions, there is a hyperplasia of all the constituent parts,—muscle, connective tissue, and glands,—causing a hypertrophy of the vaginal portion, which becomes heavy and large, filling the vaginal vault and dragging upon the uterus In other cases there is a partial necrosis of the vaginal portion, diminishing its projection into the vagina and reducing it to a mass of fibrous tissue, covered with squamous epithelium and seamed with the fissures of two or more longitudinal tears.

The result of a bilateral or stellate tear, or of extensive cicatricial infiltration, is a never-ending local irritation leading to chronic congestion not only of the cervix, but of the whole uterus; to endocervicitis and to endometritis; to cervical catarrh and a consequent leukorrhea. There is always danger of epithe-

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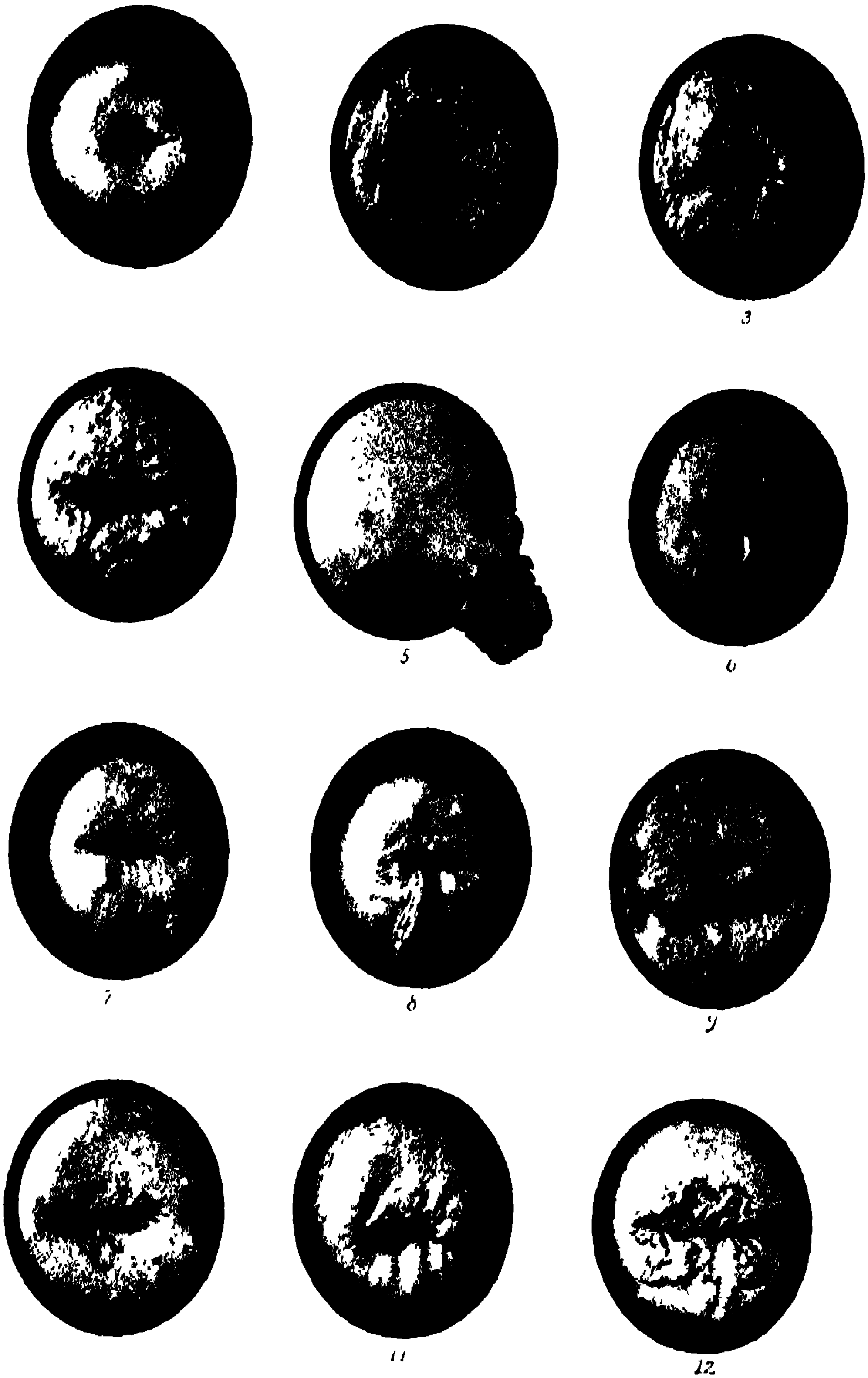
[1] It was believed in the prescientific era that these cysts were ova.

PLATE 7.



Injuries and erosion of the cervix: 1. Normal cervix; 2, 3, 4, 7, 9, 11, 12, erosion of the cervix, 5, 6, 8, 10, endocervicitis and follicular cervicitis

lioma from the constant and long-continued irritation; the vast majority of these growths have their origin in an old injury of the cervix. As a prophylactic measure alone, therefore, the repair of lacerations of the cervix is indicated. Moreover, the leukorrhea and the menorrhagia of endocervicitis and endometritis may only be permanently cured by the repair of cervical injuries. It is possible, also, to witness a varied train of neurasthenic and reflex symptoms referable to lacerations of the cervix and only disappearing after their repair; but the influence of cervical injuries upon the general health has been much exaggerated in the past, and the physician must be on his guard against attributing too much importance to the local lesion in a neurasthenic individual with impairment of the general health.

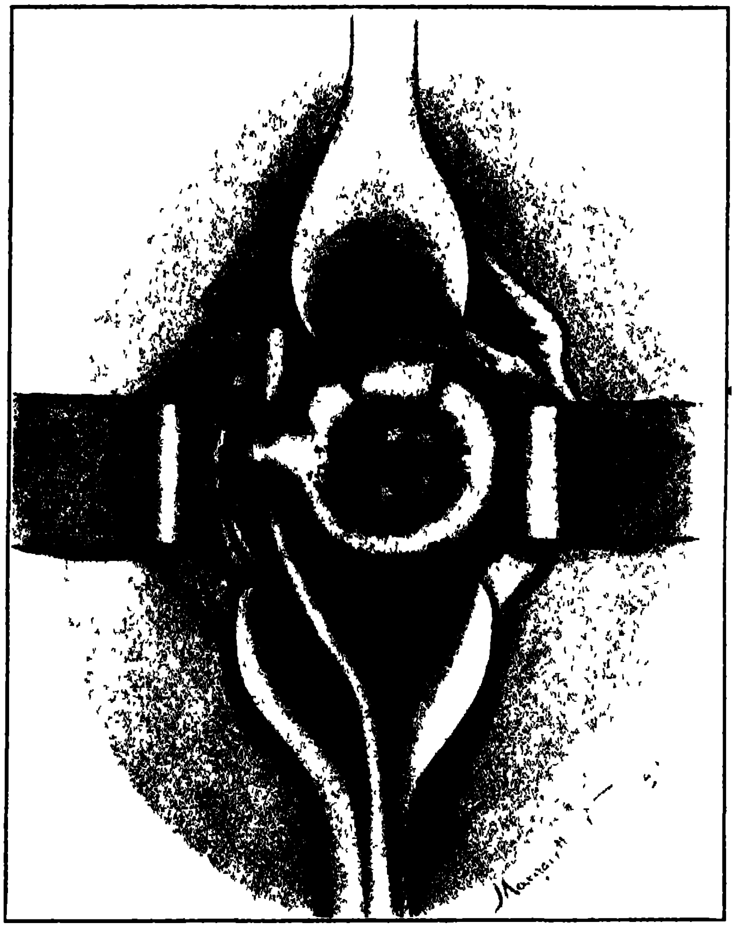


Fig. 226.—Fibromucous band uniting cervix with vaginal vault.

A circular laceration of the cervix results in the detachment of the vaginal portion. There is no likelihood of trouble subsequently, for the ultimate result is as good as is secured by a deliberate amputation.

Abrasions of the cervix are of no moment unless they are apposed to abraded surfaces on the vaginal vaults, in which case the cervix may adhere to the vaginal wall immediately or by a band of cicatricial and mucous tissue.

The Treatment of a Lacerated Cervix.—The immediate repair of lacerations of the cervix is possible, but not always advisable, for several reasons: The stitches which are tight enough when inserted hang loose in a day or two on account of the reduction in the size of the cervix by involution; the bruised and edematous condition of the cervix and the profuse flow of lochia over it do not conduce to primary union of the wounds; the exposure of the os uteri as the cervix is pulled into view with bullet forceps predisposes to infection of the uterine cavity, and many a case of lacerated cervix heals spontaneously if the woman is kept quiet after labor and vaginal douching is avoided. Intermediate repairs of the cervix in the early puerperium after forty-eight hours are always practicable and should be the practice of the specialist at least. After the completion of the puerperium, if there is much erosion, applications of nitrate of silver solution (gr xx to ℥j) to the cervix every other day soon reduce the hyperplasia of the columnar epithelium and restore a healthy appearance If there is considerable eversion with the likelihood of continued irritation, repair of the injury should be recommended. If the patient is first seen long after the labor in which she was injured, the decision in regard to operation is governed by a number of considerations. A unilateral tear as a rule needs no treatment, unless there is extensive cicatrization. A stellate tear without erosion or ectropion does not necessarily demand operation A bilateral tear with ectropion, but with no erosion, without evidences of extensive cicatrization, and with no associated leukorrhea or metrorrhagia, is not of itself an indication for operation On the contrary, if there is erosion and ectropion, with leukorrhea and menorrhagia; if there is considerable hypertrophy, cicatricial infiltration, or fixation of the cervix, an operation is advisable.

Preparatory treatment is often of advantage before the operation. An application of nitrate of silver solution, pricking the retention cysts, and applying a tampon saturated with boroglycerid every other day for a week or two, produce a surprising improvement in the appearance of the cervix and insure a greater certainty of success for the operative treatment.

The operation selected for a cervical injury differs with the character of the tear and the condition of the cervix. A simple bilateral laceration indicates Emmet's trachelorrhaphy. A stellate tear, great hypertrophy, extensive cicatricial infiltration, and fixation of the cervix indicate an amputation. Whenever one is in doubt as to the suitable form of operation, it is better to decide on an amputation. The coaptability of the cervical lips is tested by bringing them together with tenacula. A careful examination of the uterine appendages should be made before operating on the cervix, for pelvic inflammation contraindicates such an operation, unless it is immediately followed by an abdominal section for the removal or other surgical treatment of chronically inflamed, distended, or adherent tubes and ovaries.

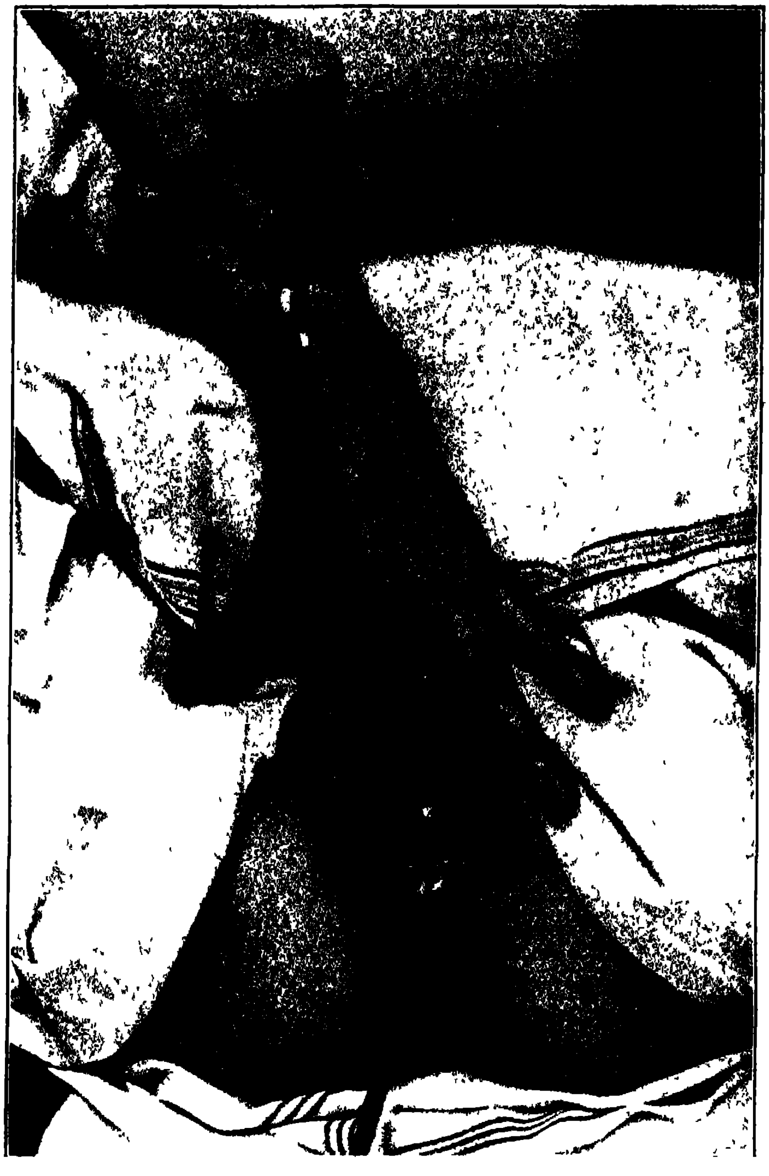


Fig. 227.—Displaying a lacerated cervix by pulling it out of the vulva

As in all plastic operations in the pelvis, but most particularly in those upon the cervix, a curettage of the uterine cavity should precede the plastic operation. (See page 645.)

Emmet's operation for bilateral laceration of the cervix is performed by catching each lip of the cervix with a bullet forceps or double tenaculum, which pulls the cervix into view. A speculum is not necessary. An assistant holds the tenacula apart, thus separating the lips, and pulls them to one side, exposing the tear first to be repaired. The area to be denuded is marked by a sharp knife cutting rather deeply, care being taken to leave a wide enough cervical canal. The mucous membrane within the incisions is seized with a rat-toothed forceps and cut out, with some underlying tissue, in one piece by small, sharp-pointed scissors curved on the flat. The long-handled curved Emmet scissors are awkward and unnecessary. The other side is similarly treated. At the upper angle of the wound the points of the scissors cut quite deeply to remove the cicatricial plug, on which some operators lay great stress. The denudation being completed, interrupted sutures of silkworm-gut are inserted and gripped with a hemostat. After all the sutures are in place they

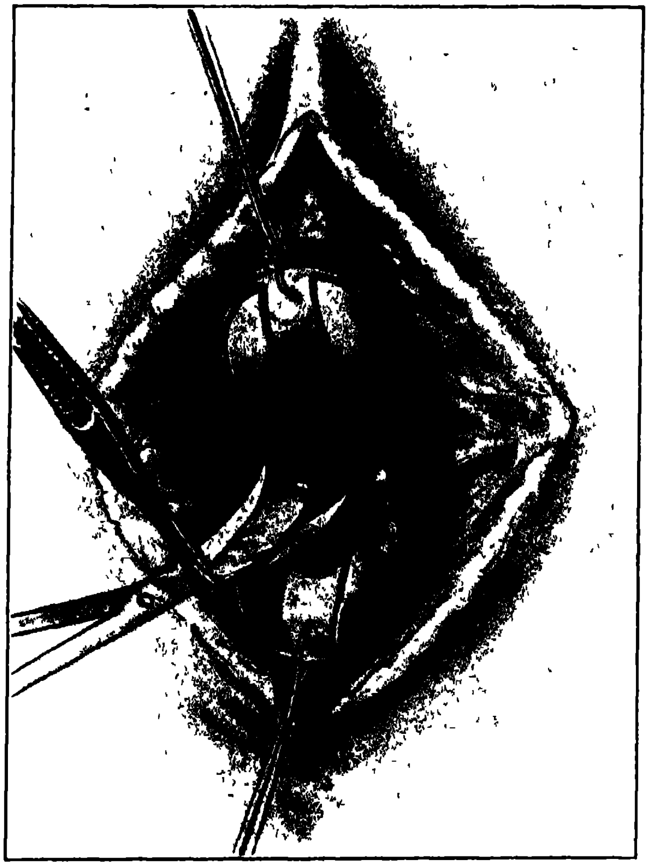


Fig. 228.—Showing incisions made by a knife, marking out area to be denuded; the flaps removed in one piece by scissors; lines defining area of denudation, and scissors removing tissue in one piece

are shotted one side at a time from above downward, an assistant sponging the wound clean of blood as each shot is run home and clamped. The sutures are cut off about an inch from the shot for convenience of removal.

There are three methods of amputating the cervix to be considered, the selection depending upon the cervical condition.

In the Simon's operation the cervix, seized by the two bullet forceps, one in each lip, is split laterally on both sides with straight scissors, one blade in the cervical canal, the other upon the exterior of the vaginal portion. A wedge-shaped piece is exsected from the whole width of each lip and a longitudinal piece is exsected from the inner edges of the lateral wounds on both sides. Two sutures of silkworm-gut are inserted on each side as in Emmet's trachelorrhaphy, and two or more sutures are placed in the anterior and in the posterior lips, uniting the triangular wounds left by the wedge-shaped exsections. The junction of the sutures by shot makes a conical cervix reduced

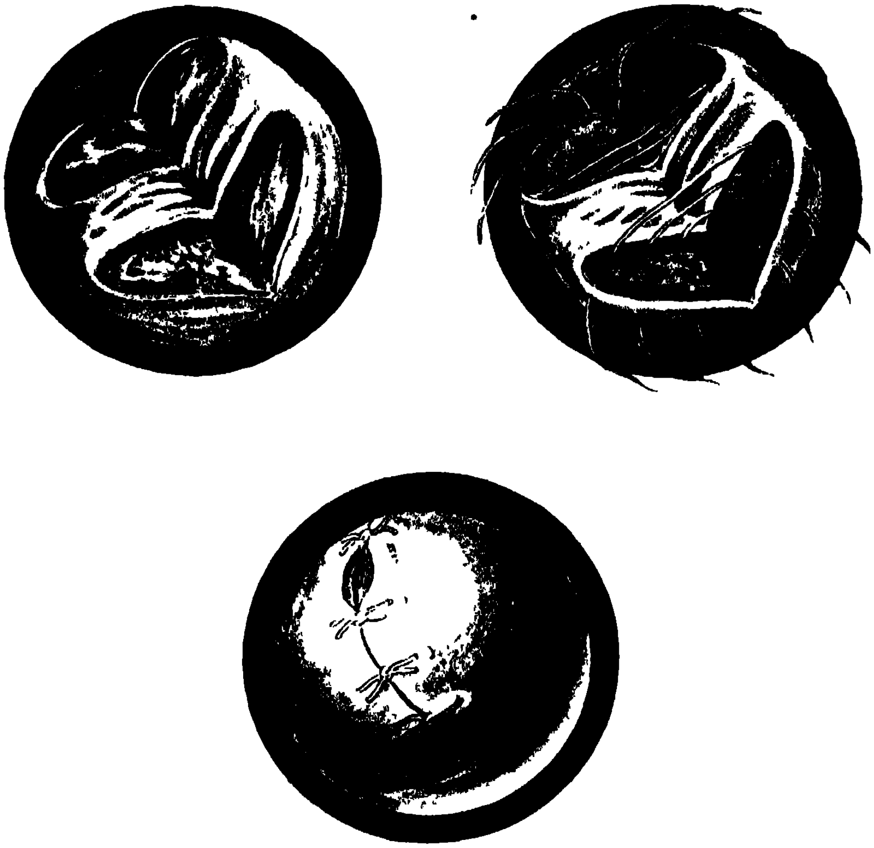


Fig 229.—1, Denudation for repair of lacerated cervix; 2, sutures inserted; 3, sutures united.

in length and breadth compared with its dimensions before the operation.

In the Hegar amputation of the cervix a circular incision is

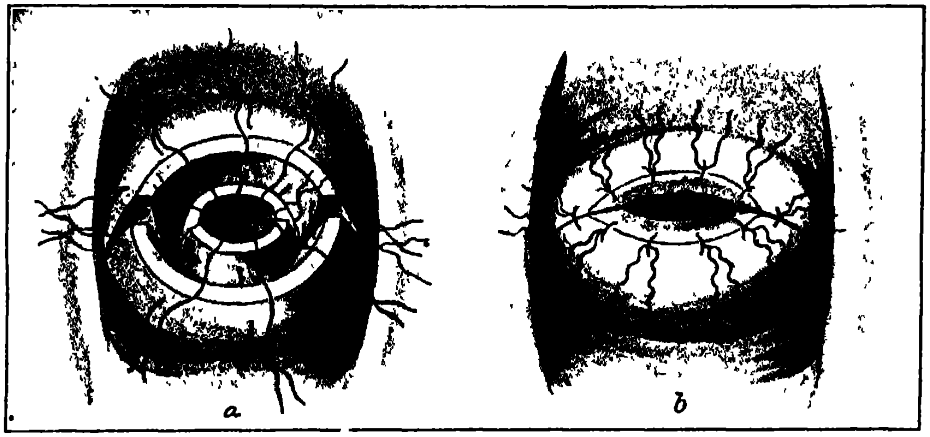


Fig 230 —Simon's cone-shaped excision of the vaginal portion : *a*, Sutures inserted ; *b*, sutures tied.

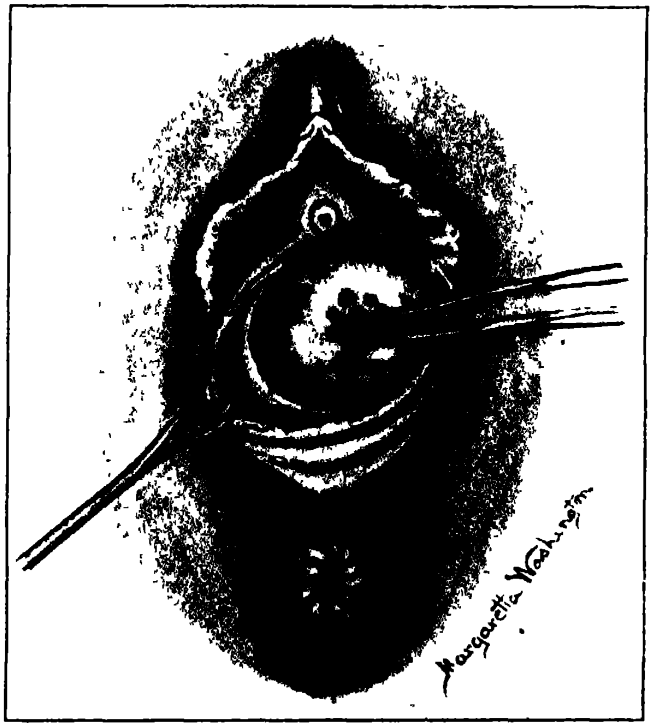


Fig. 231.—First incision for Hegar's amputation of the cervix.

made at the junction of the vaginal vaults and the vaginal portion. A cone-shaped exsection of the whole cervix is next made by dissection with a knife. The two bullet forceps that had been used to pull the cervix down are shifted from the piece removed to the anterior and posterior walls of the supravaginal portion of the cervix, the inner hook of each instrument transfixing the

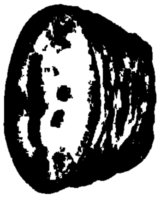


Fig 232.—Cervix removed by Hegar's amputation.

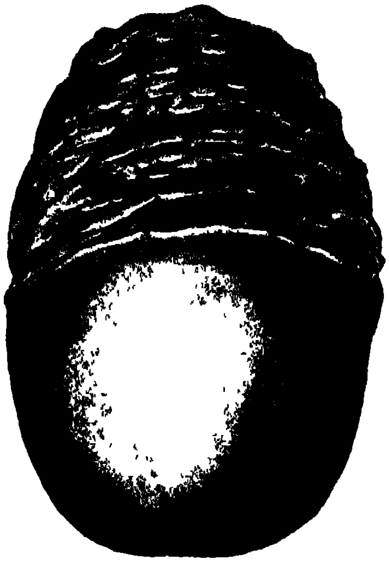


Fig. 233—Hypertrophied, elongated cervix removed by Hegar's amputation.

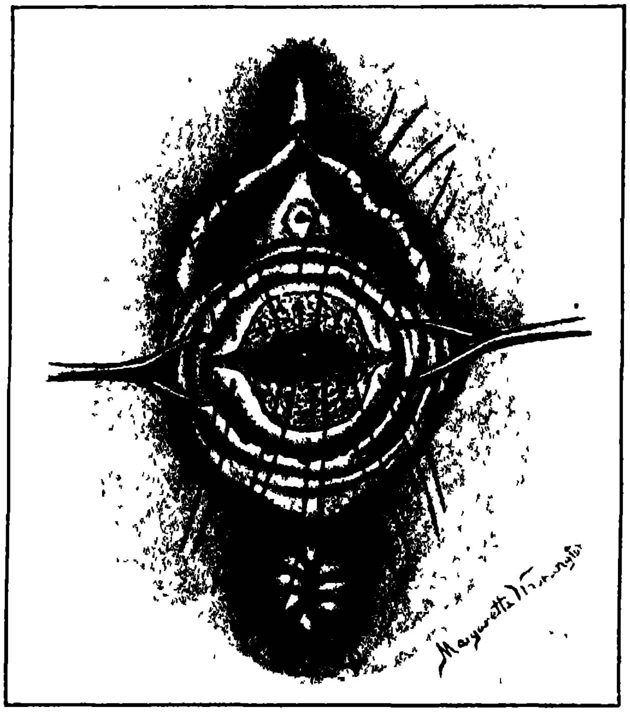


Fig. 234.—Hegar's amputation; stitches introduced

mucous membrane of the cervical canal. The sutures, which may be of catgut, are inserted two on each side of the cervical canal, without emerging in it, running from before backward, bringing together the mucous membrane of the vagina over the raw surfaces of the cervix on both sides of the canal, and two or three sutures each through the posterior and anterior walls of the cervix, uniting the vaginal and the cervical mucous membranes. This modification of the original Hegar amputation, in which all the stitches emerged in the cervical canal, makes a much neater coaptation and gives a more satisfactory ultimate result.

In Schroeder's operation the cervix is split laterally The whole cervical mucous membrane is excised with a great part of the myometrium under it. The squamous mucous membrane of the vaginal portion is preserved and is turned into the cervical canal, where it is sutured. The lateral wounds are united with interrupted sutures.[1]

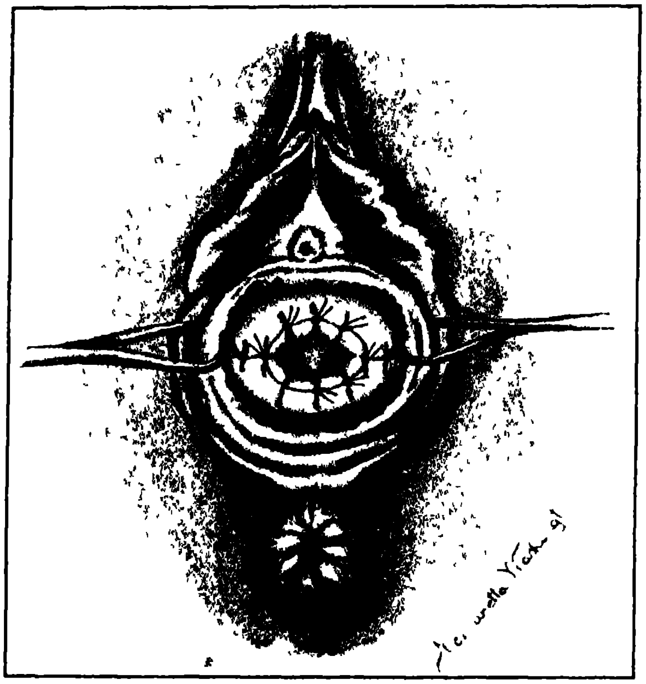


Fig 235 —Hegar's amputation; stitches tied

The first form of amputation is adapted to cases of hypertrophy of the cervix, more particularly in its breadth It is the best operation in women of child-bearing age. The second method is most suitable in cases of complex stellate tear, extensive cicatricial infiltration, an unhealthy condition of the cervical canal

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[1] Pouey's operation is designed to accomplish the same result as Schroeder's, but is not so satisfactory. A longitudinal incision is made through the whole length of the mucosa of the cervical canal. A cuff or muff of mucosa with an underlying layer of myometrium is dissected out of the cervical canal; the mucous membrane of the external os is joined to that of the internal os.

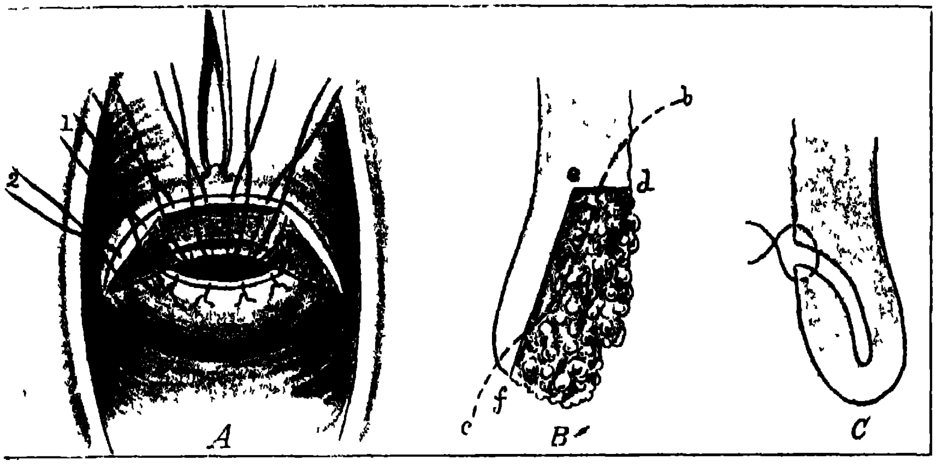

Fig. 236.—Schroeder's single-flap excision of the vaginal portion: *A*, Excision made, sutures placed on anterior lip and tied on posterior; 1 and 2, lateral sutures. *B*, Longitudinal section through cervix; *d e*, transverse incision; *f e*, longitudinal incision joining the first and severing the mucous membrane and part of the muscular tissue from the cervix; *b c*, course of a suture; *g*, ovula of Naboth. *C*, Longitudinal section after the sutures are tied.

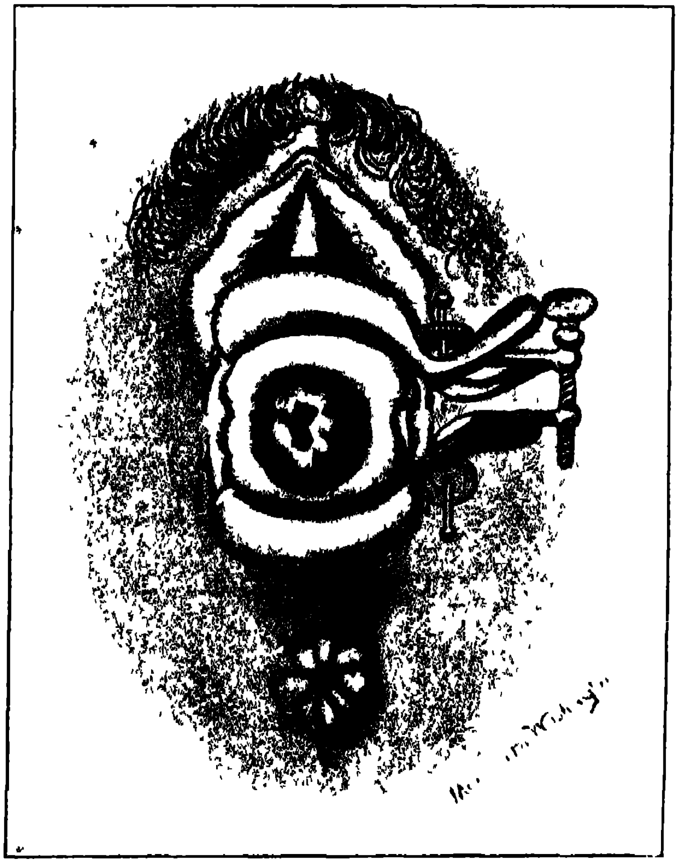

Fig. 237.—Superinvolution or atrophy of the cervix.

extending a considerable distance upward, and to an elongated cervix It is the best operation in women at or past the menopause. Schroeder's operation is intended to remove diseased mucosa from the cervical canal.

Atrophy and superinvolution of the cervix are associated with the same conditions in the uterus. The symptoms are referable to the latter. The only justification for separate mention of these conditions of the cervix is their diagnostic value in the recognition of atrophy and superinvolution of the uterus on a specular examination. The cervix is diminished in all directions, and presents in miniature the varying conditions seen in the well-developed or normally involuted vaginal portion. That is, it may be conical in shape, may show signs of the various injuries to which it is subject, or may have the appearance represented in figure 237, due to a superinvolution of the myometrium, with a lesser degree of atrophy of the cervical endometrium, causing a prolapsus and protrusion of the latter.

Cervicitis.—The squamous epithelium of the vaginal portion may be the seat of inflammations which have the same causes, present the same appearance, and require the same treatment as the various kinds of vaginitis There is a peculiar form of cervicitis, however, which deserves a special description.

Erosion of the Cervix.—In consequence of an irritation of the vaginal portion of the cervix and of the canal, the squamous epithelium of the former is converted into columnar epithelium over varying distances from the external os, sometimes almost to the vaginal vaults.[1] The commonest cause of irritation is a laceration of the cervix, therefore erosion is most often associated with laceration of the cervix. Another common cause, however, is a catarrh of the cervix. A typical erosion, therefore, may be seen in nulliparous women, giving somewhat the appearance of laceration and ectropion if the erosion extends on the anterior and posterior lips rather than laterally The error has been made in such cases, of describing a "congenital laceration of the cervix," which is, of course, impossible. Histologically, Ruge and Veit have demonstrated that the basic cells of the squamous epithelium on the vaginal portion are converted into cylindrical epithelium, the squamous cells above them disappearing. There is a tendency to tubular gland-formation by an ingrowth of these cells into the myometrium. Often there is an exuberant growth outward, especially of the interglandular connective tissue As one of these two tendencies predominates, there is a follicular or a papillary erosion. As may be seen by this description, there is no ulceration in an erosion. One or two papillæ may be deprived of their epithelial covering, and may be covered by granulation cells, but there is no ulceration in the true sense of the word.

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[1] Ruge and Veit, "Zur Pathologie der Vaginalportion," "Zeitschr. f. Geburtsh. u. Gyn.," Bd. ii, i, 415. See also Veit's "Handbuch," vol. ii, p. 256

To the sense of touch a cervix the seat of erosion is often large and soft or it may be infiltrated with scar-tissue. The region of the os has a velvety feel from the thickened soft mucous membrane, which bleeds easily on touch. Seen through a speculum the vaginal portion around the external os is a deeper red in color, and the epithelium looks thick and rough. Papillary outgrowths may be observed. There is an increase of the cervical mucous discharge, and from the area of the erosion blood may ooze as a result of the digital examination or the contact of the edge of the speculum with the cervix.

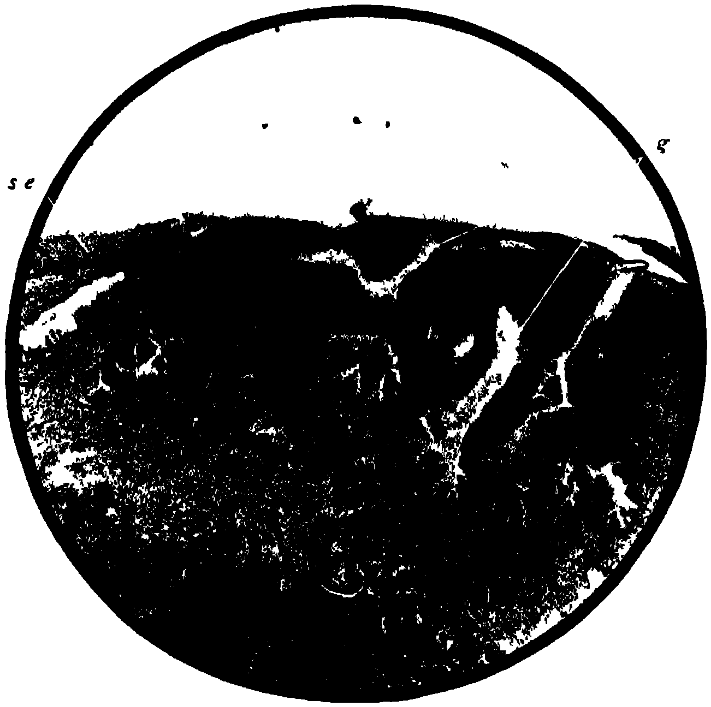

Fig 238 —Erosion of cervix. This section was cut from a portion of the cervix that should be entirely covered by squamous epithelium, which has partly disappeared · *s.e*, Remains of squamous epithelium ; *g*, cervical glands opening on surface (McConnell and J. C. Hirst)

The treatment of erosion is an application of nitrate of silver, 20 or 60 grains to the ounce, three or four times a week ; the insertion of boroglycerid tampons, and a daily douche of boracic acid solution. The application of the positive pole of a galvanic current 40 milliampères by a conical electrode wrapped in cotton moistened with salt solution is often the quickest and surest means of curing an erosion It may be necessary to remove the cause of the cervical irritation; therefore a curetment of the uterine cavity and the operative treatment of lacerations of the cervix may be required.

Inflammation of the cervical myometrium may be acute from infection of the uterus after childbirth or operations, in which case it is associated with acute metritis. More commonly the inflammation is a chronic interstitial cervicitis, the consequence usually of injuries in childbirth. The result is a hypertrophic cirrhosis indicating amputation of the cervix The cervical glands are usually obstructed by the overgrowth of connective tissue around their ducts, and there is a hyperplasia from chronic congestion, so that a chronic cervicitis is both interstitial and glandular or follicular, the distended glands appearing as vesicles under the squamous epithelium of the vaginal portion or projecting as small cysts into the cervical canal.

An acute exacerbation of congestion may be combated and the chronic condition may be temporarily improved by multiple punctures in the cervix, and a local bloodletting; by pricking the distended glands to evacuate them, and by glycerin tampons applied to the cervix and allowed to remain for twelve hours at a time. A permanent cure, however, is only secured by amputation or by trachelorrhaphy.

Endocervicitis is most frequently the result of lacerations of the cervix or of gonorrhea. It may, however, be due to any of the causes that produce endometritis (page 355) In the endocervicitis of an injured cervix there is usually a hyperplasia of the columnar epithelium, which spreads out from the os on the vaginal portion in the so-called cervical erosion. The cervical glands partake in the congestion, inflammation and hypertrophy of the mucous membrane, and excrete an abnormal quantity of characteristic thick viscid mucus (cervical leukorrhea). There is also an extensive round-cell infiltration of the cervical endometrium, and a great enlargement and increase of the capillaries. The membrane is thick and velvety in appearance, and within the canal is roughened, thrown into exaggerated transverse folds, projecting into the canal or perhaps out of the os in polypoid excrescences which may develop into mucous polyps of considerable size.

The cervical glands are a favorite lurking-place for gonococci, from which they are dislodged with the greatest difficulty, and where they may lie dormant for a long time.

The endocervicitis of a chronic gonorrhea produces a viscid mucopurulent discharge hanging out of the external os in a thick rope.

The most satisfactory treatment for endocervicitis from an injury is trachelorrhaphy or amputation of the cervix.

If an operation is contraindicated or impracticable for any reason, applications of nitrate of silver, 60 grains to the ounce, or of iodin, to the cervical canal and to the vaginal portion, reduce the hyperplasia of the columnar epithelium and in time convert the columnar into squamous cells. Painting the vaginal portion with iodin as a counterirritant and the application of glycerin tampons hasten the cure.

The endocervicitis of gonorrhea is exceedingly difficult to cure. Application of nitrate of silver, of chlorid of zinc in weak solutions, of 50 per cent. solutions of argyrol, and of iodin, the insertion of soluble bougies into the uterine cavity, impregnated with protargol, argyrol, and other antiseptics and astringents; the application of a strong galvanic current (40 milliampères) through the positive pole, may produce temporary improvement, but there is likely to be a recurrence of the mucopurulent discharge over a period of years, with the reappearance in it of infectious gonococci. A high amputation of the cervix may be necessary to effect a permanent cure.

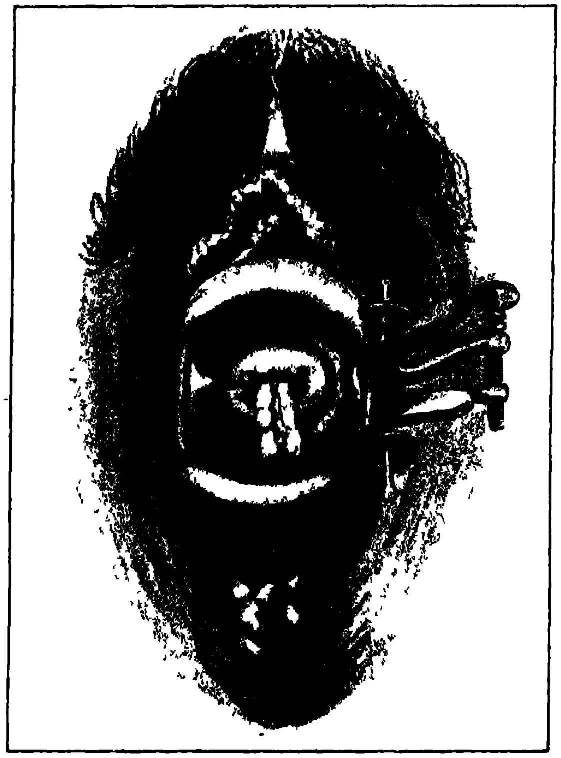

Fig. 239 —Gonorrheal endocervicitis.

Ulceration of the Cervix.—What is ordinarily and erroneously called ulceration of the cervix is a hyperplasia of the columnar epithelium. True ulceration, however, with loss of substance, is possible. It is seen in prolapsus uteri, in chancroids, in chancre, cancer, sarcoma, sloughing fibroids, and tuberculosis.

For the ulceration associated with prolapse, reposition of the uterus, rest in bed, applications of nitrate of silver solution and glycerin tampons are indicated. Rapid healing under this treatment is the rule.

A chancroid of the cervix should be eradicated by cauterization with carbolic acid, fuming nitric acid, a 50 per cent solution of chlorid of zinc, or the actual cautery. Tuberculosis, if not associated with the same disease elsewhere, indicates amputation of the cervix.

A rodent ulcer of the cervix has been observed—not cancerous, but gangrenous, from the calcification of the internal iliac artery.[1] The differential diagnosis between it and cancer can only be made by the microscope. The treatment is the extirpation of the uterus.

Tuberculosis of the Cervix.—Hegar first called attention to cervical tuberculosis in 1886.[2] Reported cases have multiplied with comparative rapidity, though the condition is rare. More than 70 cases are now recorded.[3] Spaeth estimates that cervical tuberculosis constitutes only 5 per cent. of the cases of genital tuberculosis in women.

There are three forms of cervical tuberculosis: (1) Miliary, (2) diffuse tubercular infiltration with ulceration, cheesy degeneration, and fibroid change; (3) the papillary hypertrophic tubercular endocervicitis.

The miliary form is associated with general tuberculosis; there are numerous miliary tubercles under the mucous membrane of the vaginal portion, breaking down into minute superficial ulcers.

The diffuse infiltration with ulceration and fibroid degeneration is characterized by hypertrophy of the cervix, distortion of its shape, ulcers on the vaginal portion or in the cervical canal, covered with a yellowish or grayish deposit, with well-defined edges, raised and indurated.

The papillary form is characterized by an exaggerated hyperplasia of the cervical endometrium projecting from the external os in a tumor which is usually no larger than a cherry, but has reached the size of an apple, rose-red in color, associated with papillary erosion of the vaginal portion for a distance of one or two centimeters around the external os, and enlargement, infiltration, and distortion of the cervix.

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[1] Williams, "London Obstet Soc. Tr," vol xxvii.

[2] "Die Entstehung, Diagnose, und chirurg Behandl der Genitaltuberculose des Weibes," Stuttgart, 1886.

[3] Beyea, "Tuberculosis of the Portio Vaginalis and Cervix Uteri," "Amer. Jour Med. Sci.," November, 1901 Glockner, "Zur papillären Tuberculose der Cervix uteri u. der Uebertragung der Tuberculose durch die Kohabitation," "Beiträge zur Geburtsh. u. Gyn.," Hegar, Bd. v, Berlin, 1901.

Tuberculosis of the cervix may be secondary or primary. It is almost always the former, in which case it is usually due to a descending infection from the tubes and the corporeal endometrium. In the recorded cases of infection of the tubes and of the cervix without involvement of the corpus uteri, the infection has probably passed from the former to the latter by the lymph-ducts.

There are four cases recorded of primary tuberculosis of the cervix and six in which the cervical infection was probably primary. Primary infection of the cervix may be explained by the insertion of infected instruments or fingers, the contamination of the external genitals from tubercular sputum or discharges from the bowel; and to infected spermatic fluid. Glockner's case was undoubtedly due to tubercular orchitis in the woman's husband.

The subjective symptoms of tuberculosis of the cervix are not distinctive. There is usually a leukorrhea tinged with blood, and there may be failing health. Menorrhagia and amenorrhea have both been noted. The duration of the disease is much longer than that of cancer.

The objective symptoms have been described in the description of the varieties of the disease

Tuberculosis of the cervix is most often confused with cancer. It may be distinguished from malignant disease by the longer history, the lesser degree of infiltration, the absence of a large cauliflower growth, friability of tissue, abundant fetid discharge, and deep crater-like ulceration. While the tuberculous cervix may bleed on touch, there is not the tendency to profuse hemorrhage that there is in cancer. The microscopical study of tissue removed for the purpose is the most valuable diagnostic test. In tubercular disease there is the characteristic histology of tubercular tissue, tubercle bacilli are usually discoverable in careful and repeated examinations, and inoculation experiments in guinea-pigs should give positive results.

The treatment of tuberculosis of the cervix is palliative and radical. The former is called for if there is extensive tubercular disease elsewhere threatening an early fatal termination. It consists of local cauterization and disinfection.

The radical treatment is indicated if it is possible to remove all the tuberculous tissue without danger of stirring up tubercular processes elsewhere in the body. If the tuberculosis is confined to the cervix, amputation suffices. A patient with tuberculosis of the cervix and of the tubes has been cured by a high amputation, a curetment and ablation of the tubes (Beyea) The surest treatment to effect a permanent cure is a panhysterectomy with removal of the uterine appendages, by the vaginal or the combined vaginal and abdominal methods (page 242).

Acquired Atresia of the Cervix.—The external os, the internal os, or the whole cervical canal may be closed in consequence of ulceration of the cervical mucous membrane and agglutination of apposed granulating surfaces. The cause of the ulceration may be strong caustics applied to the canal, an adynamic or infectious fever, the disturbances of nutrition seen in prolapsus uteri and in old age, the injuries and inflammations following childbirth or abortion, malignant growths, or the intense congestion of pregnancy exaggerating an inflammation already present. The author has seen two cases in women approaching the menopause without ascertainable cause

In old women past the menopause atresia of the cervix may cause no symptoms unless there is a fibroid tumor or a cancer of the uterus. In menstruating women there is a retention of blood (hematometra), mucus (hydrometra), or pus (pyometra) within the womb. Should the contents of the uterus be infected by the gas bacillus or by saprophytes causing decomposition, gas may accumulate within the uterine cavity (physometra). The following are the symptoms of atresia of the cervix in menstruating women: Amenorrhea, but the more or less regular appearance of menstrual molimina. The uterus becomes a cystic tumor the size of a clenched fist or larger. In physometra it may be possible to elicit a tympanitic note on percussion or crepitation on palpation. There is pain aggravated at the periods and most acutely felt, as a rule, in one or both ovarian regions. The tubes are gradually distended by the fluid which accumulates in them (hematosalpinx, hydrosalpinx, or pyosalpinx).

In one of the author's cases the fluid was spontaneously discharged every three or four months, giving the patient complete relief for a time until the opening closed again and the menstrual blood reaccumulated.

If the external os is the site of the atresia (*conglutinatio orificii externi uteri*), the cervical canal and the intra-uterine space become a single cavity; the vaginal portion loses its nipple-like projection into the vagina and is flush with the vaginal vault. It may be impossible to feel the external os, but its site is usually marked on inspection by a perceptible dimple.

Before undertaking the treatment of atresia of the cervix, the condition of the tubes should be ascertained by a combined examination. If they are distended, they should be removed by abdominal section before or immediately after the evacuation of the uterus.

To relieve the distention of the uterine cavity and to establish the patency of the cervical canal, the site of the atresia should be punctured by a trocar or, if practicable, by a blunt-pointed instrument, such as an applicating forceps. The canal should then be dilated with branched dilators, the uterine cavity thoroughly washed out with a large quantity of boracic acid solution until it is completely emptied, and then packed with a strip of iodoform gauze, which must be removed in twenty-four hours at the most, when there should be another irrigation followed by fresh packing. After the second or third day the passage of Hegar's graduated cervical bougies should be begun and continued daily for a week or more, preceded and followed by a uterine irrigation. The patient must be kept under observation for some months, a bougie being passed occasionally to test the patency of the canal

In old women without symptoms from the atresia, in whom the condition is accidentally discovered, no treatment is required

NEW-GROWTHS OF THE CERVIX.

Myomata of the cervix are rare Winckel declares that he never saw one. Other authors put their frequency as compared with uterine myomata at 5 to 8 per cent. Sänger draws a distinction between infravaginal and supravaginal myomata of the cervix, pointing out that the former grow downward into the vagina and the latter usually backward into the retro-uterine connective tissue, between the peritoneum above and the vaginal mucous membrane below.

A myoma occupying one lip of the cervix pushes the other away from it as it grows into the cervical canal, making the os crescentic in shape. The periphery of the tumor may contract adhesions with the mucous membrane of the cervical canal with which it comes in contact, thus in part obliterating the canal. In a case of the author's a cervical myoma the size of an apple, occupying the left lateral lip of the cervix, showed the signs, in a microscopical examination, of incipient malignant degeneration at its periphery in the cervical canal, and the mucous membrane of the canal opposite this part and in contact with, but not adherent to it, had likewise undergone malignant change (epitheliomatous). An enucleation of the tumor and a high amputation of the cervix cured the patient, who had no recurrence five years later.

The symptoms of a cervical myoma are metrorrhagia, leukorrhea, dysmenorrhea, sterility, and possibly a feeling of weight or heaviness in the pelvis. A retro-uterine growth may obstruct or irritate the rectum. A growth in the anterior lip may cause vesical irritability or dysuria.

The **treatment** of a cervical myoma is enucleation, which is usually easy. An incision over the growth enables one to shell it out of its bed without difficulty, even if it has reached a considerable size. The cavity may be packed with gauze until it is closed by granulation, or its walls may be approximated by sutures if it is comparatively shallow and there is little oozing.

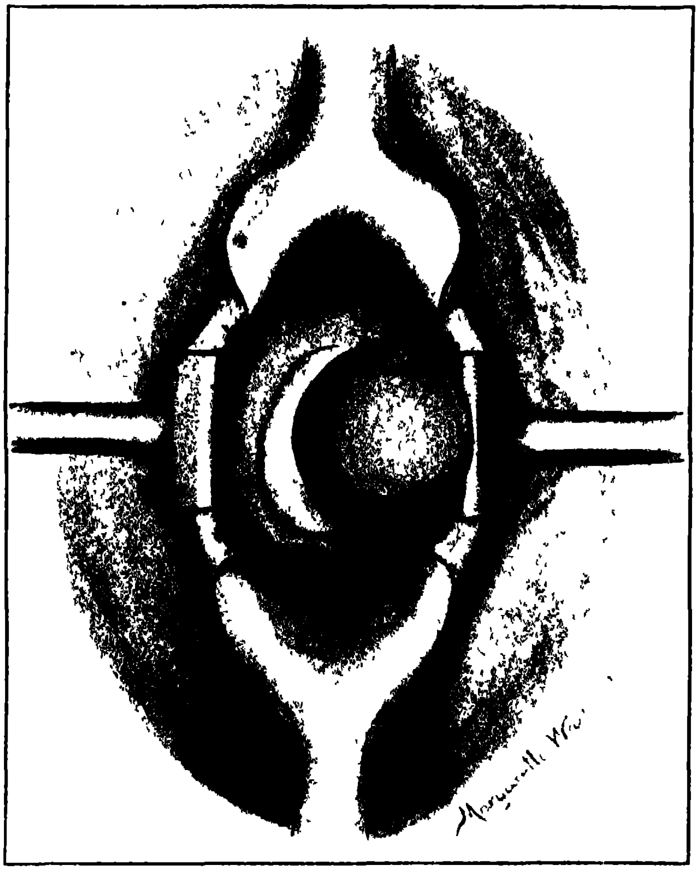
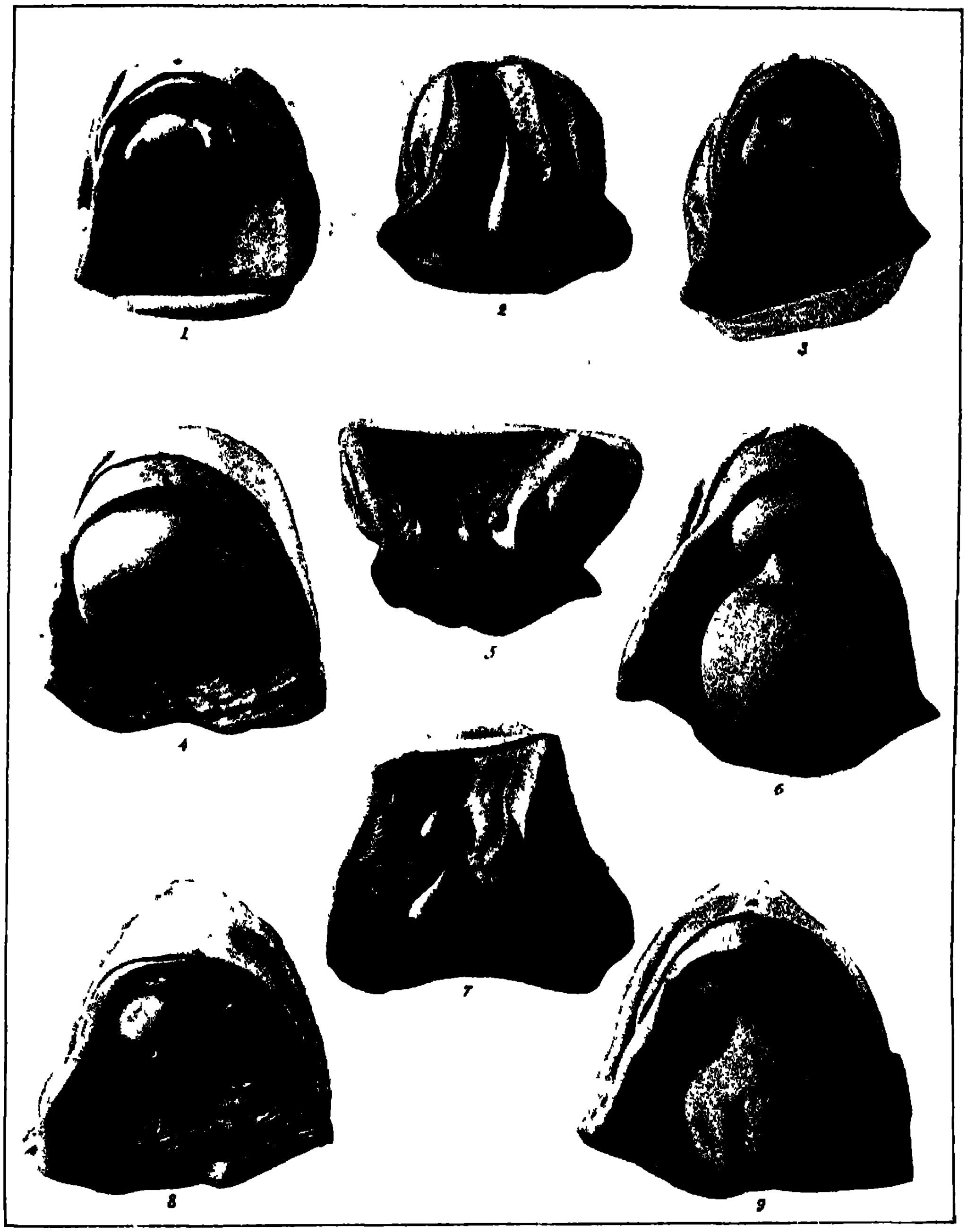


Fig. 240.—Fibroid polyp protruding from the cervix.

The cervical mucous membrane is often the seat of polypoid tumors consisting of all its constituent parts,—connective, mucous, and glandular tissues and blood-vessels,—one of these structures usually predominating over the others. Mucous polyps are soft, rich in glands, covered with the columnar epithelium of

PLATE 8.



Mucous polyps of the cervix

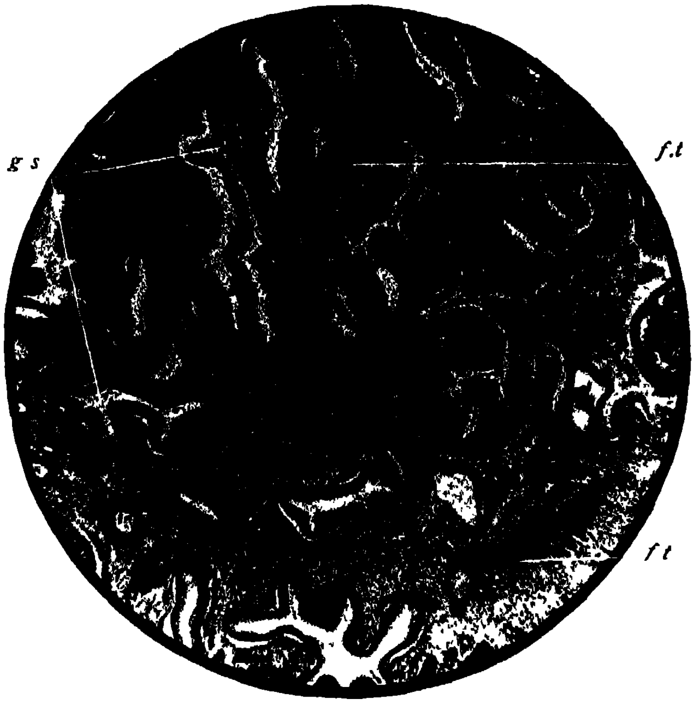


Fig 241.—Fibro-adenomatous polyp of cervix: *f.t*, Fibrous tissue; *g.s*, gland-spaces lined by typical cervical columnar epithelium (McConnell and J. C. Hirst).

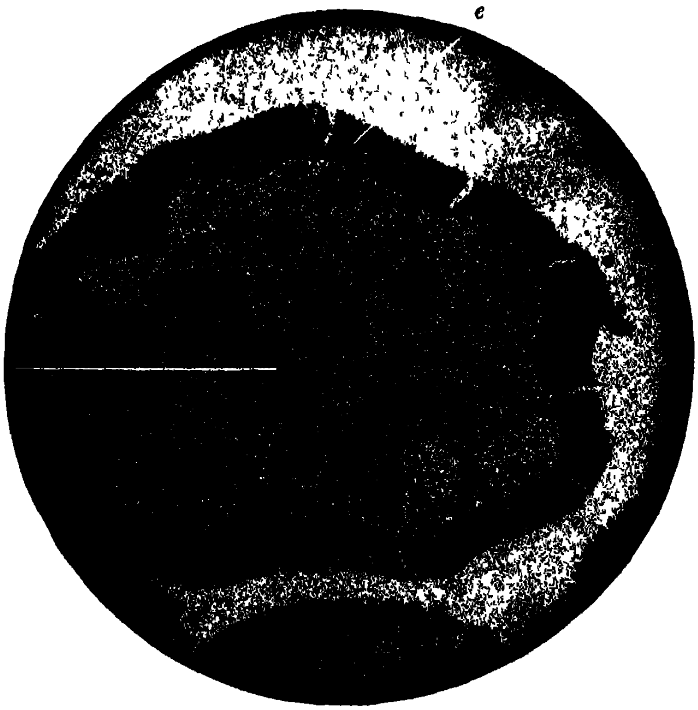


Fig. 242.—Mucous polyp of cervix: *m.c.t*, mucoid connective tissue; *e*, epithelium (McConnell and J. C. Hirst).

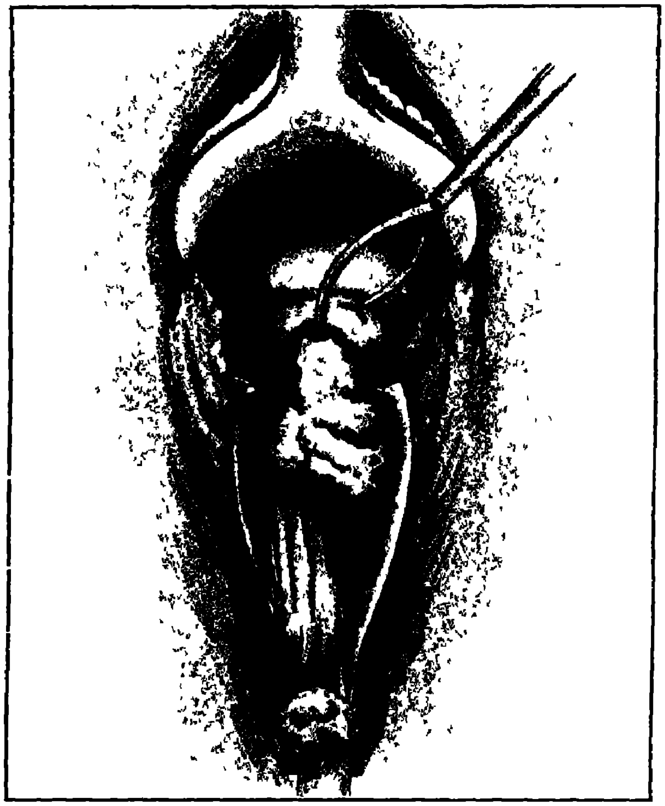


Fig. 243.—Ribbon-shaped polyp of cervix

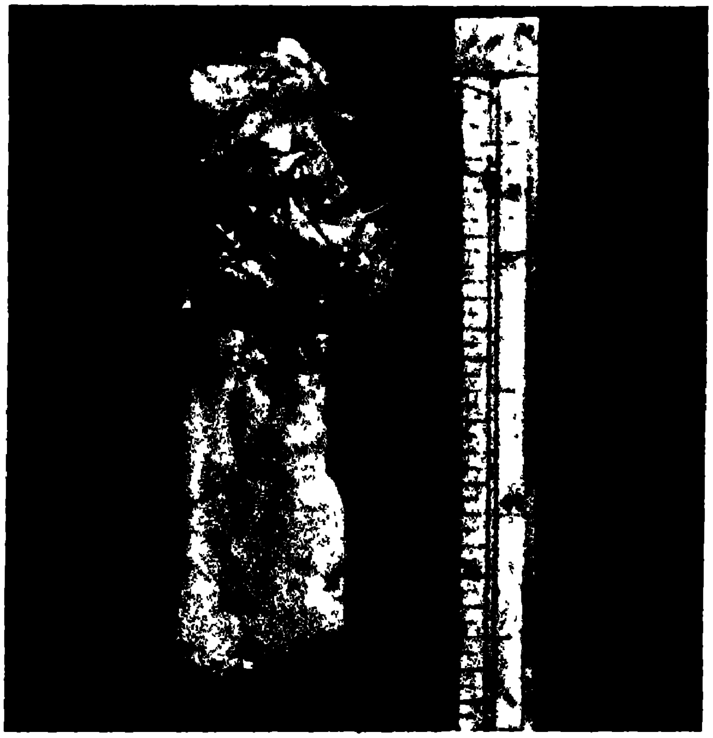


Fig. 244.—The same, photographed after removal.

the cervical canal, and a dark red in color. They rarely reach the size of a walnut. After attaining the size of a pea or a cherry they project beyond the os, where they are easily discovered on a digital or a specular examination.

Fibroid polyps show a preponderance of connective tissue, are usually spherical in shape, may reach a considerable size after emerging from the os, are as firm as cartilage in feel, and are usually a bright scarlet or light pink in color. The pedicle is commonly slender. A fibro-adenomatous tumor of the cervix may be ribbon-shaped (Fig. 243). Polyps in which the blood-vessels are predominant have a cavernous structure like that of the bulbi vestibuli or the corpus cavernosum of the penis.

The first symptom of cervical polyps is ordinarily a menorrhagia or metrorrhagia, which may be so severe that the patient is almost exsanguine. There may also be rhythmical cramps, expulsive uterine pains, and dysmenorrhea before the polyp emerges from the cervix. Leukorrhea is common and dyspareunia is a possible symptom after the polyp projects from the cervix A cervical polyp before it appears at or outside the external os uteri is easily overlooked even by an experienced specialist. A menorrhagia may be treated in vain by a curettage of the uterine cavity, by intra-uterine applications, and medicinally until its cause is discovered in a polyp which at length protrudes from the cervical canal. A dilatation of the canal and its digital exploration enable one to avoid such a mistake.

Polypoid tumors of the cervix are best treated by seizing them with a volsella forceps and making three or four sharp turns of the instrument on its long axis, thus twisting off the pedicle A curettage and an irrigation of the uterine cavity should follow the avulsion of the tumor. The apparently small operation should be performed with careful aseptic precautions and should be followed by rest in bed for at least forty-eight hours. This is not an operation for office practice. The author has seen severe infection follow its careless performance

It has been proposed to remove cervical polyps by cutting their pedicles with scissors, the galvanocautery wire, or the wire ecraseur, but these methods are inferior to avulsion by torsion If their base is too broad for avulsion, they may be enucleated after incision of the capsule.

Carcinoma of the Cervix Uteri.—The uterus is the commonest site of cancer in the human body. It is on this account mainly that women die of cancer more than twice as often as men. The cervix uteri is affected by cancer more than four times oftener than the body. Cancer seems to be on the increase in all civilized countries, and there are certain districts where it is unusually prevalent. Dührssen states that the deaths from cancer in Germany number 25,000 annually. Another German author states that 1 per cent. of women between forty and fifty die of cancer; that there are more deaths from this cause than from labor, and that the death-rate from cancer is greater than the mortality of the Franco-Prussian war.

Etiology.—Traumatism and a consequent long-continued irritation and congestion are the most important predisposing causes of cancer of the cervix. The vast majority of cases have a history of five or more labors. In nulliparous women there is often a history of dilatation of the cervix or other operative interference. Heredity plays a subordinate rôle as a predisposing cause. Less than a fifth of the cases have a family history of cancer.

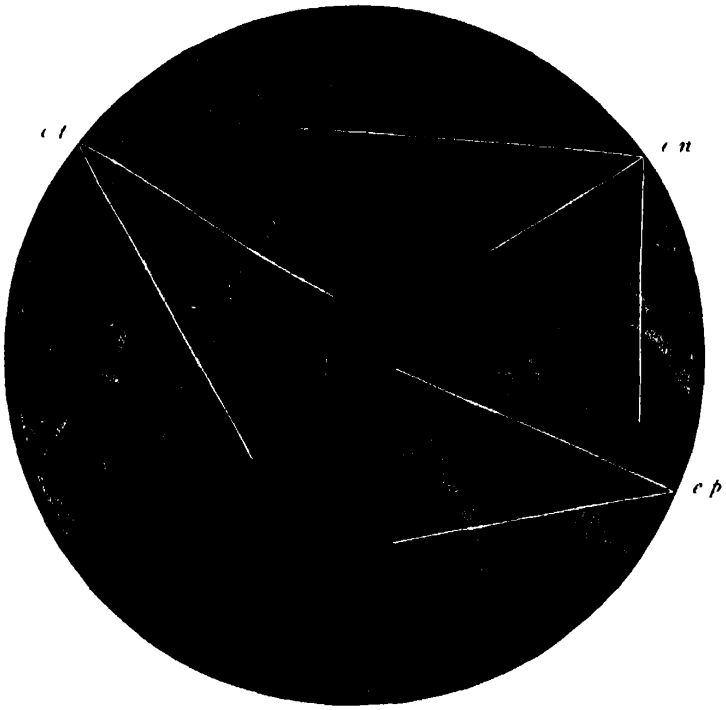


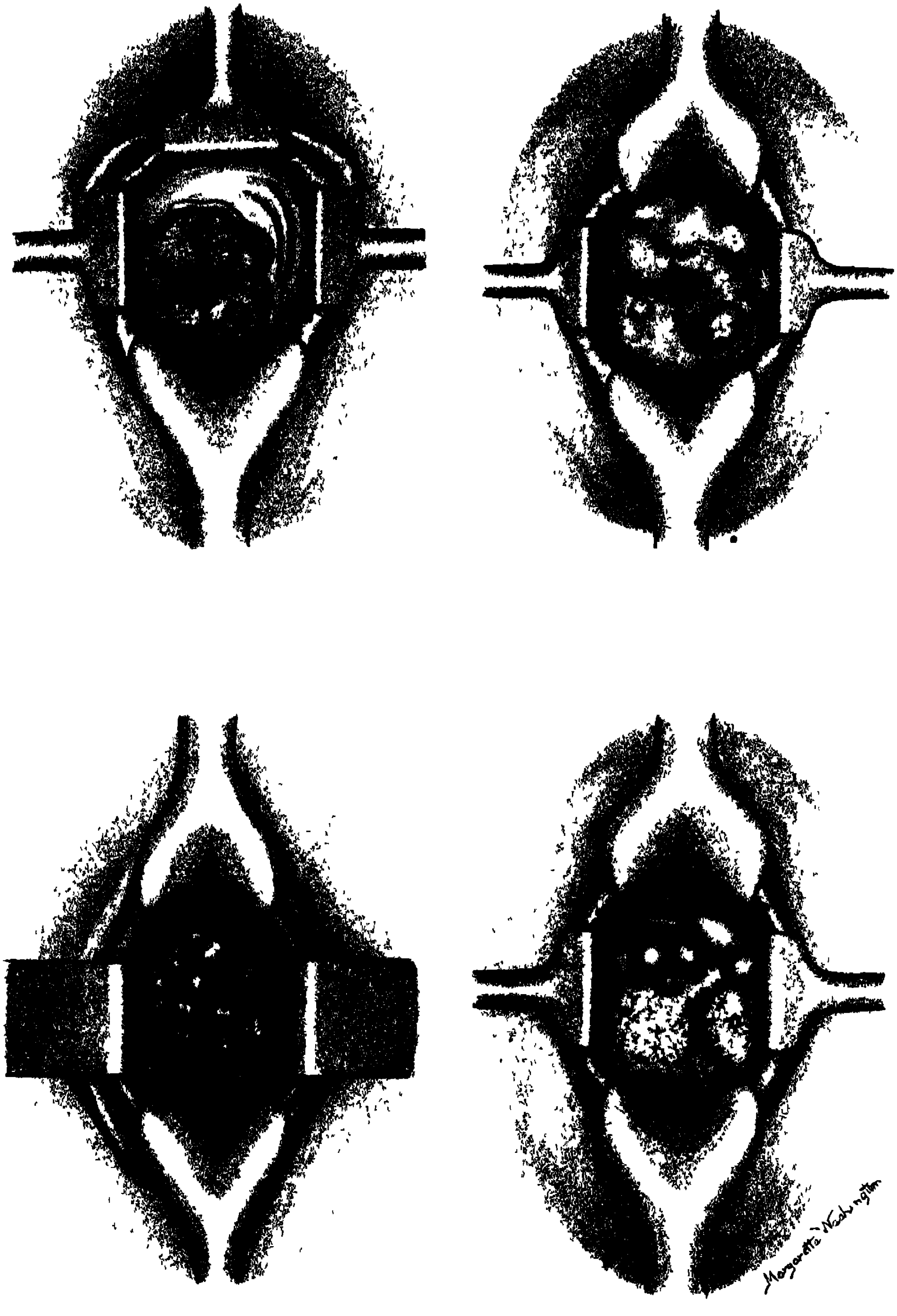
Fig. 245.—Epithelioma of cervix, showing pearls: *e.n*, Epithelial nests; *c.t*, connective-tissue trabeculæ; *e.p*, epithelial pearls (McConnell and J. C. Hirst)

Pathology.—Cancers of the cervix may present one of four types—squamous-cell carcinoma (epithelioma), adenocarcinoma, endothelioma, and malignant adenoma.

Squamous-cell carcinoma is much the commonest, occurring almost seven times as often as adenocarcinoma of the cervix. Endothelioma and malignant adenoma are exceedingly rare.

Squamous-cell carcinoma develops from the squamous epithelium of the vaginal portion. It commonly begins, therefore,

PLATE 9.



Types of squamous-cell cancer of the cervix.

on the exposed surface of the cervix, possibly in the cleft of an old cervical tear. The squamous epithelium, however, may have extended a considerable distance up the cervical canal in a woman who has borne several children. Consequently, an epithelioma may have its beginning within the cervical canal. The cells proliferate with great rapidity, first causing small round nodules, soon ulcerating on the surface and sending out innumerable finger-like processes which coalesce and multiply until a huge cauliflower mass may fill the vaginal vault. The cells grow rapidly within the substance of the cervix, also, producing a growth which displaces the normal cervical tissue, yellowish-white on section, firm as cartilage, made up of trabeculæ of fibrous tissue in the meshes of which are nests of epithelioid cancer-cells. The growth extends outward toward the bases of the broad ligaments, backward along the uterosacral ligaments, downward under and along the vaginal mucous membrane, and forward into the uterovesical connective tissue, involving in time the wall and the mucous membrane of the bladder. The uterine mucosa is usually healthy, or at least not carcinomatous. There may be, however, nodes of epithelioma in the uterine mucosa, but the myometrium is more likely to be the

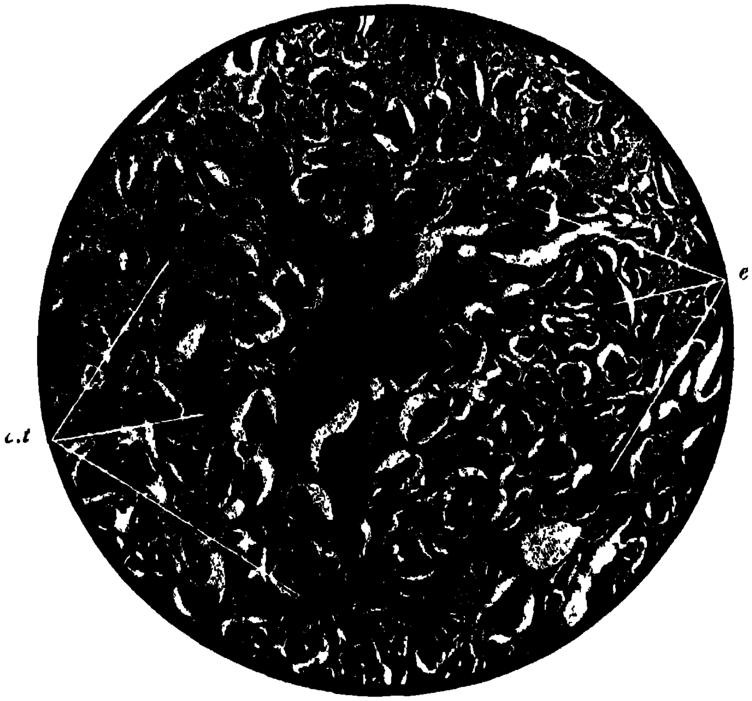


Fig. 246.—Scirrhous carcinoma of cervix: *e*, Epithelial nests; *c t*, connective-tissue trabeculæ, predominating and giving the tumor its characteristic hardness (McConnell and J. C. Hirst).

site of secondary growths. There is often endometritis, and from obstruction of the cervical canal there is not infrequently pyometra and physometra. The rectum is only involved late in the disease, after the cancer has spread down the posterior vaginal wall, as the cervix is separated from the rectum by Douglas's pouch.

Metastases to distant organs are rare, but not impossible. It is quite common to find nodules of epithelioma near the fundus uteri, and in several cases, as in one of the author's (Fig. 250), a node of incipient carcinoma may be discovered in a Fallopian tube. The exuberant growth of a squamous-cell cancer outward into the vagina is followed by necrosis of the peripheral tissues, which advances until the papillomatous character of the tumor disappears and its place is taken by a deep ulcer lined with pus, blood, and gangrenous material. The vagina ends in a deep crater-like pit with indurated, elevated edges.

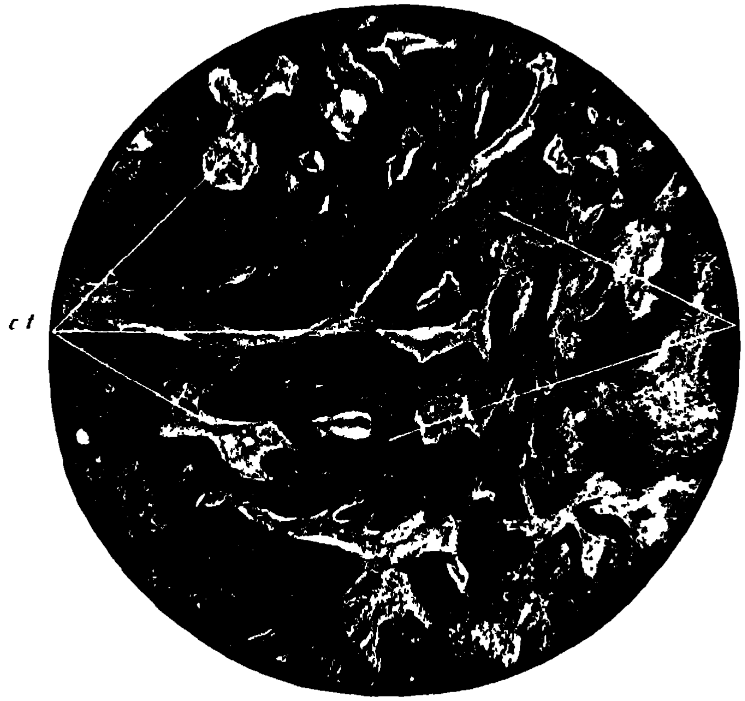


Fig. 247.—Medullary carcinoma of cervix. *c.t*, Connective-tissue trabeculæ, *e m*, epithelial masses, predominating and giving tumor its medullary characteristics (McConnell and J. C. Hirst).

An *adenocarcinoma* of the cervix begins in a cervical gland. There is an enormous hyperplasia and multiplication of the glands and their epithelial cells. Teat-like processes of the latter project into the lumen of the glands, and there is the perforation of basement membrane and invasion of surrounding structures by the epithelial cells characteristic of all cancerous growths. The new-growth begins in the cervical canal or within the myometrium of the cervix. Nodules appear and gradually grow toward the cervical canal, in which they may lie concealed until the disease has made the most extensive ravages. Ulceration occurs later than in squamous-cell carcinoma, but ultimately appears, so that a large ulcerating cavity may lie within an external os almost or quite normal in appearance Occasionally a cancerous mass of considerable size protrudes from the os and is easily detached. Adenocarcinoma of the cervix grows upward into the uterine mucosa and myometrium, or outward into the parametrium, and downward into the vagina. The bladder and rectum may be involved. The later ulcerative stages are the same in all forms of cancer of the cervix. There is a strong tendency to recurrence in a cervical adenocarcinoma, possibly because its situation often prevents its early recognition and the radical operation for its removal is undertaken too late. An *endothelioma* is made up histologically of tubules and round spaces lined with spindle-cells. The glands are normal; there are no teat-like ingrowths of cells as in adenocarcinoma; there is no branching of the glands, no

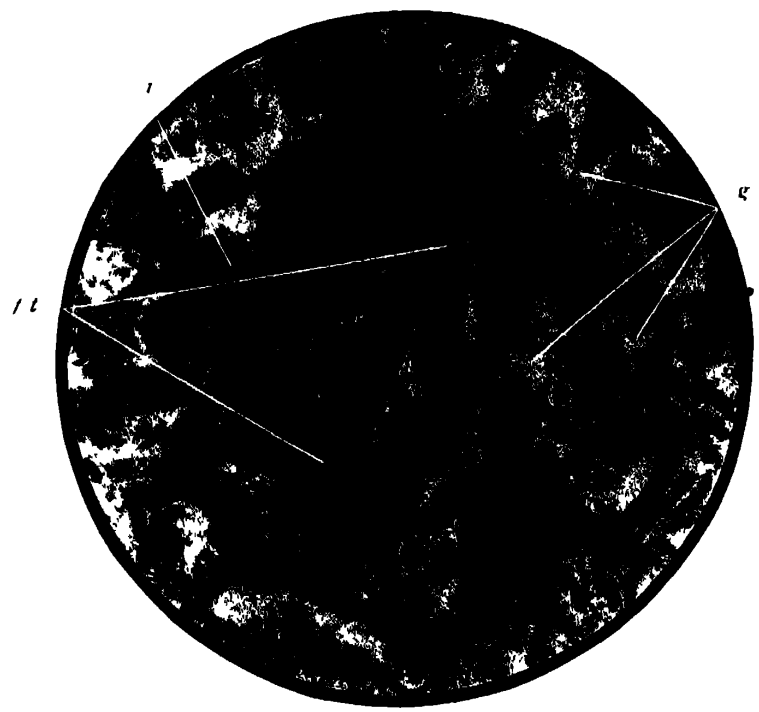


Fig 248.—Malignant adenoma of cervix: *g.s*, Gland-spaces, epithelium hypertrophied, basement membrane perforated and glands communicating; *f t*, fibrous tissue stroma, *t*, tissue infiltrated with cancer-cells (McConnell and J. C Hirst).

tendency to desquamation, and the protoplasm of one cell cannot be differentiated from that of the others (Cullen).

A malignant adenoma[1] shows a complex glandular form with a single layer of epithelium lining the gland-spaces; the glands are closely packed together, penetrate deeply into the tissues, and if there is recurrence after an operation, the same glandular structure is preserved.

All cancers of the cervix have a natural tendency to extend along the lymphatic ducts to the pelvic lymphatic glands, but, owing to the small size of the former in the cervix and the large size of the epithelial cells, the lymphatics of the pelvis, according to Winter,[2] are only involved after the cancer has extended to the pelvic connective tissue, in which large ducts may be invaded and the corresponding glands affected. The usual course of the disease is to the two glands on either side of the cervix if they exist; along the lymphatic ducts to the iliac glands at the bifurcation of the iliac arteries, or to the lumbar glands in front of the aorta. The retroperitoneal pelvic and abdominal lymphatic glands may be enlarged, congested, and inflamed in association

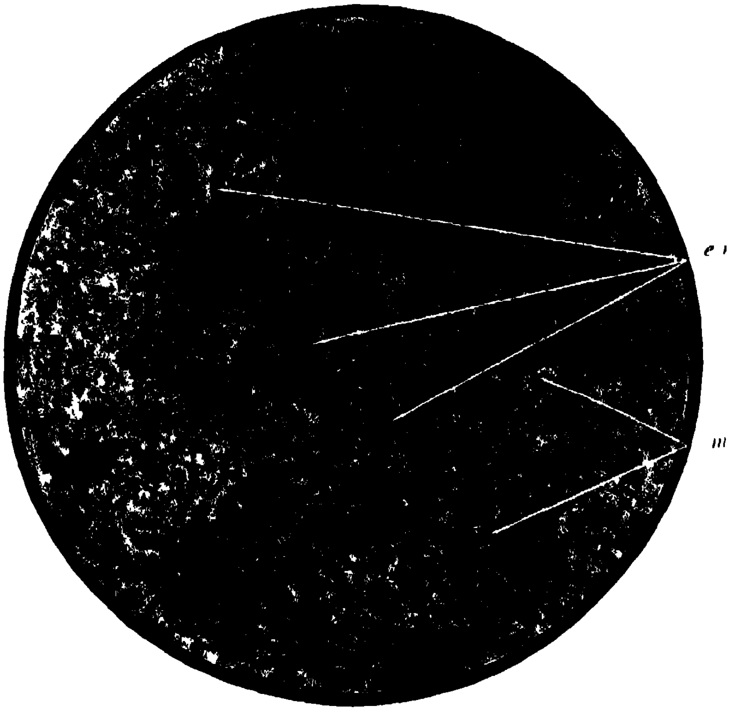


Fig. 249.—Endothelial carcinoma of cervix: *e.n*, Nests of endothelial cells; *m*, cervical myometrium (McConnell and J. C. Hirst).

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[1] Ruge and Veit, "Zeitschr. f. Geburtsh. u. Gyn.," Bd. vii, p. 170.

[2] "Ueber die Recidive des Uteruskrebses, insbesondere uber Impfrecidive," George Winter, Stuttgart, 1893.

with carcinoma of the cervix uteri without being themselves cancerous.

Clinical History and Symptoms.—Cancer of the cervix is most commonly seen in women between forty and fifty, or after the menopause. It has been observed in a woman seventy-five years old, and an adenocarcinoma has been found in a child of eight. In a case of the author's in the Howard Hospital there was a recurrence after vaginal hysterectomy in a woman not quite twenty-five. In a colored woman of twenty-seven years a vaginal hysterectomy was performed for epithelioma of the cervix, and one of twenty-four was discharged as inoperable.

The first symptom to attract the patient's attention is a bloody discharge. There may be simply a menorrhagia at first, but there is soon an intermenstrual bleeding, especially after coitus or some unusual exertion, which is due to the friable character of the delicate finger-like processes constituting the exuberant or cauliflower growth of the earlier period of the disease.

The bleeding at first is moderate in amount and may not alarm the patient or even attract her attention. If it occurs after the menopause, it is often welcomed as a sign of continued or returning sexual activity Preceding, accompanying, or following the bloody discharge there appears a leukorrhea, at first watery in character, later of a thicker consistency, more purulent, containing necrotic fragments, and soon acquiring a peculiarly offensive odor, which is often described as characteristic of cancer, but which is due to the sloughing of the cancerous mass, and is observed also in a sloughing myoma.

Many women present an appearance of perfect health until comparatively late in the disease. In some the cancerous cachexia appears early. In all it develops as the disease progresses The weight diminishes, the color is a peculiar yellowish or grayish-white, the appetite is poor, and the general strength fails. The cachexia is explained by the hemorrhage and a septic intoxication. The blood becomes poor in hemoglobin and red blood-corpuscles. There is a slight leukocytosis There is said be an abnormal excretion of nitrogen from the body, much in excess of what is ingested. Pain is scarcely ever noted until the disease is far advanced and has invaded other pelvic structures besides the uterus. It may then be excruciating and scarcely controllable by drugs.

The excretion of urine is commonly diminished by obstruction of the ureters, as the cancerous infiltration surrounds them. There is hydronephrosis and usually uremia, which mercifully terminates the patient's sufferings in the majority of cases

The bladder-wall and the vesical mucous membrane in time exhibit nodes of cancer, rapidly breaking down and establishing by ulceration a vesicovaginal fistula. Late in the progress of the disease, after the posterior vaginal wall is extensively involved, the rectum may be perforated, so that there is a cloaca in which are mingled feces, urine, and the fetid discharges from the cancer.

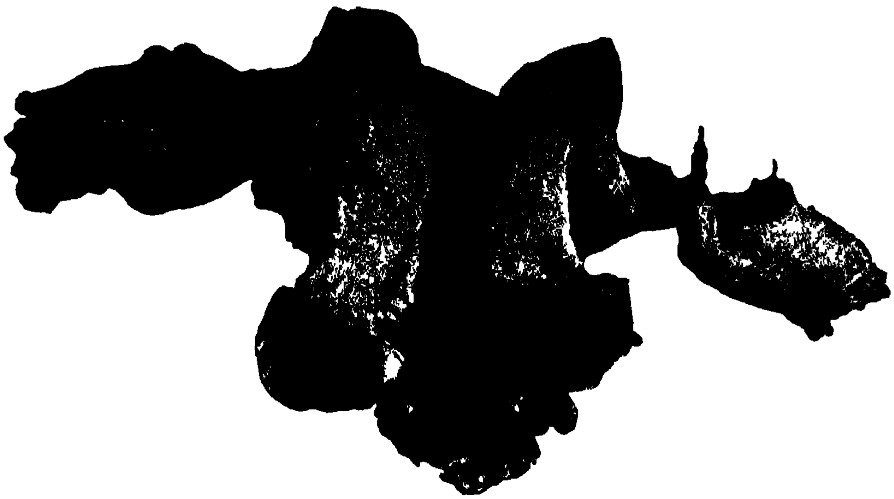

Fig. 250 —Squamous-cell cancer of cervix, papillary growth

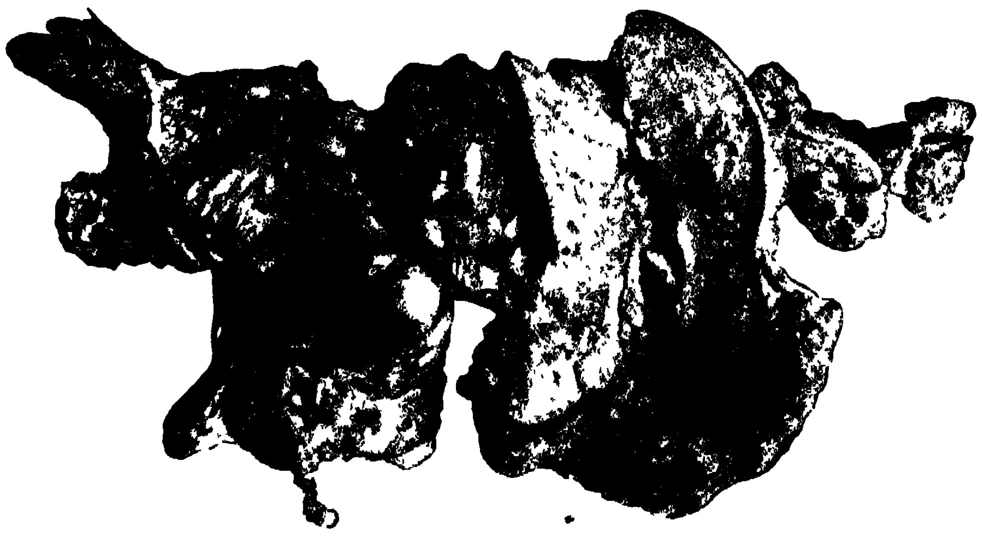

Fig 251 —Incipient squamous-cell cancer of the cervix.

The uterine wall, especially posteriorly near the lower uterine segment, may be perforated, but the general peritoneal cavity is shut off by adhesions, and death from peritonitis is rare.

The diagnosis of cervical cancer is made by the patient's history, her appearance, the odor of the discharge, a digital and specular examination of the vagina and cervix, and a microscop-

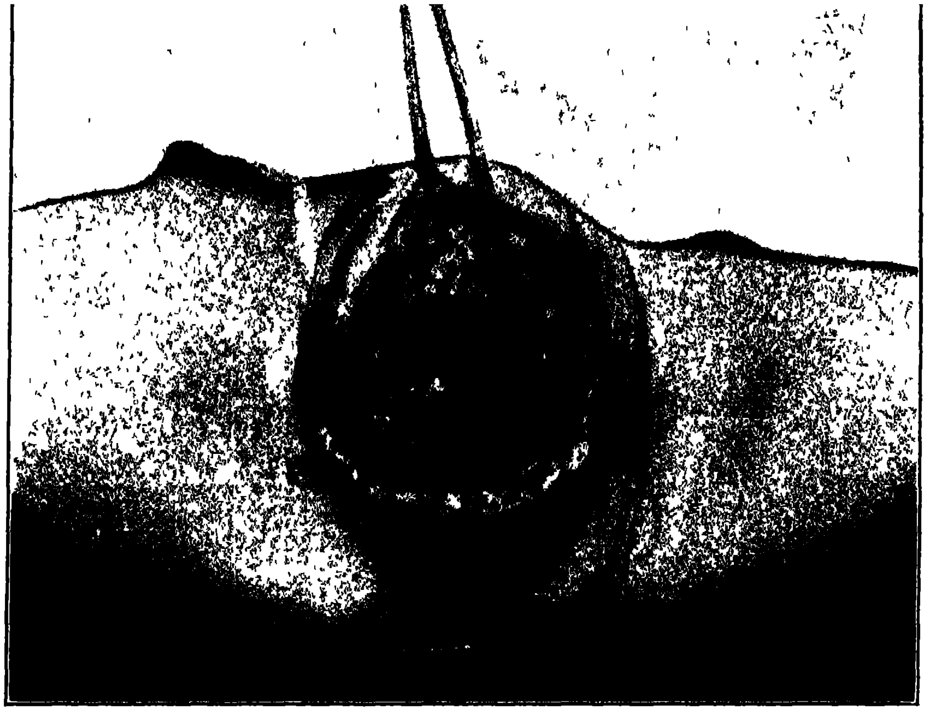

Fig. 252.—Prolapse of the uterus and epithelioma of the cervix.

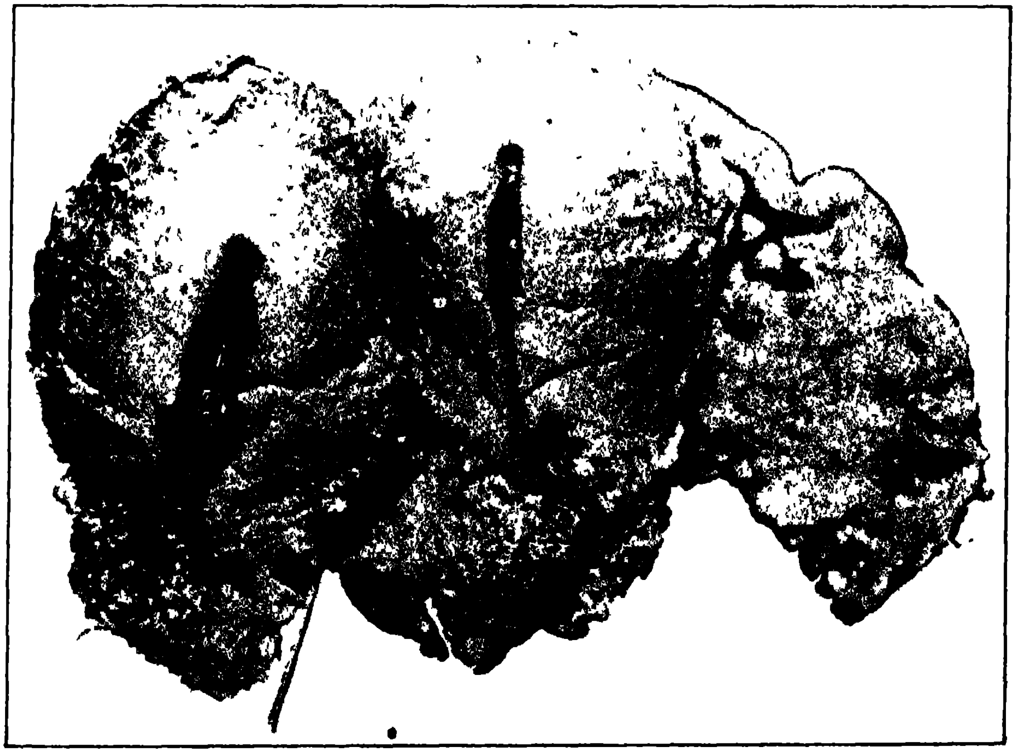

Fig. 253.—Squamous-cell cancer of cervix, ulcerative stage.

ical examination of a portion of the diseased cervix removed for the purpose. Bleeding from the vagina in a woman of middle or advanced age should always excite suspicion of uterine cancer,

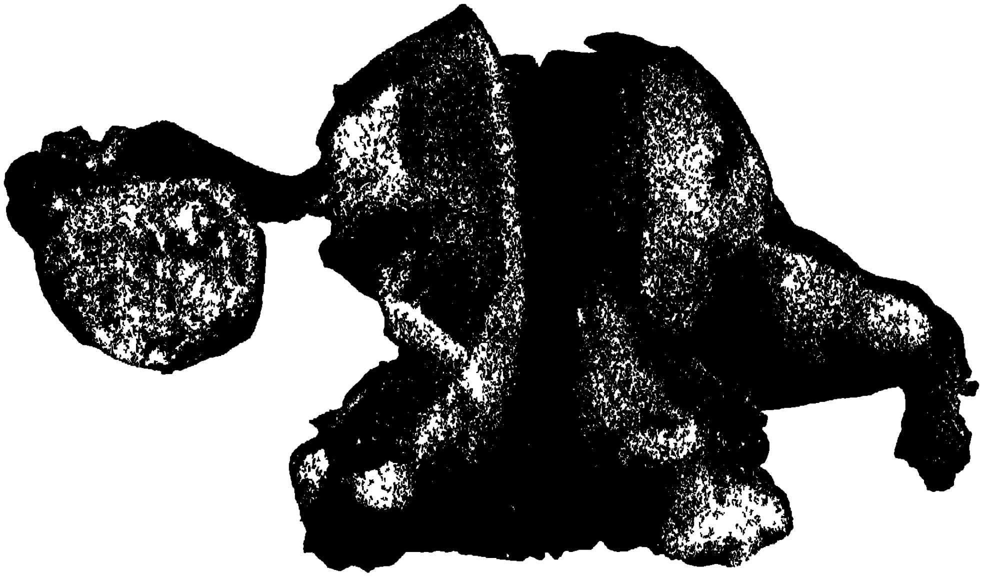

Fig 254.—Incipient adenocarcinoma of cervix

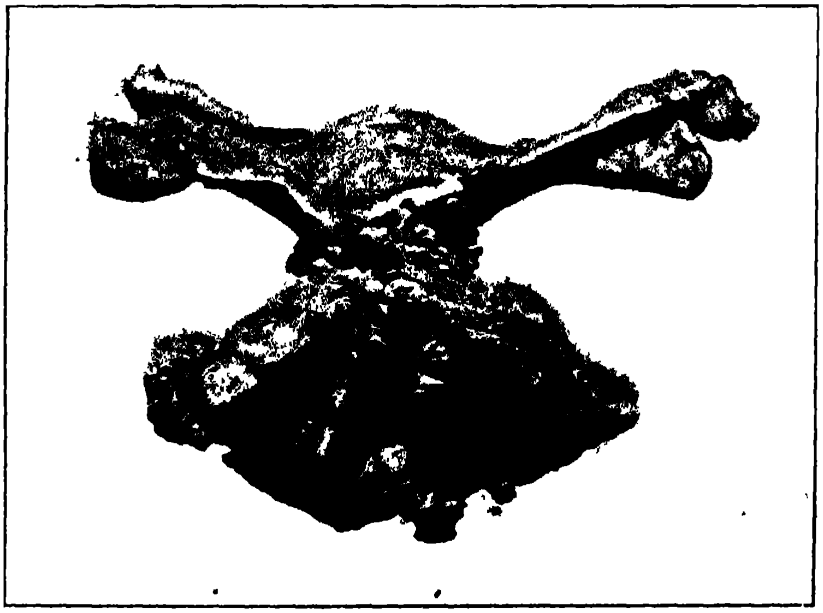

Fig 255.—Epithelioma of cervix.

and should indicate a careful examination without delay. Thousands of lives might be saved if the significance of this symptom were bet[illegible] understood by women. It is a physician's duty to inculcate this lesson in his patients, and to combat the pernicious notion that metrorrhagia is a natural precursor or concomitant of the menopause which need cause no concern. If the patient

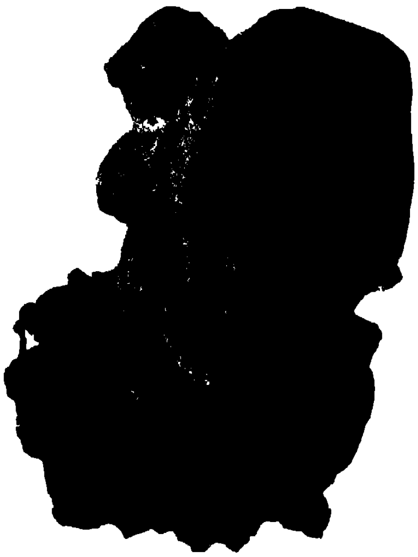

Fig 256.—Squamous-cell cancer of cervix.

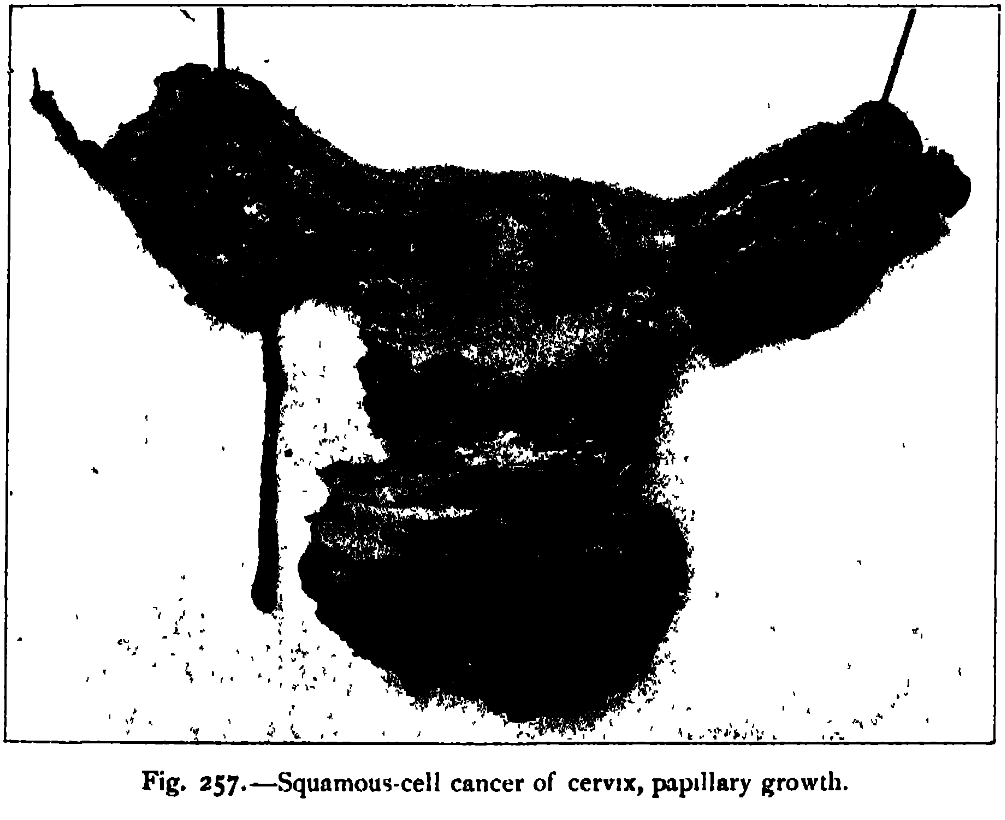

Fig. 257.—Squamous-cell cancer of cervix, papillary growth.

exhibits cachexia and gives a history of decreased weight in addition to metrorrhagia, the suspicion of cancer is strengthened.

The foul odor of the discharge has a certain diagnostic value. It may be due to a sloughing myoma, a piece of placenta, or a foreign body, such as gauze, left in the vagina a long time, but the commonest explanation is the sloughing of a cancer. On digital examination the find differs according to the stage of the disease. In the beginning nodules may be felt; the cervix is usually enlarged, and its consistency is unnaturally firm. Ulcers with indurated edges may be appreciated, or, most commonly, exuber-

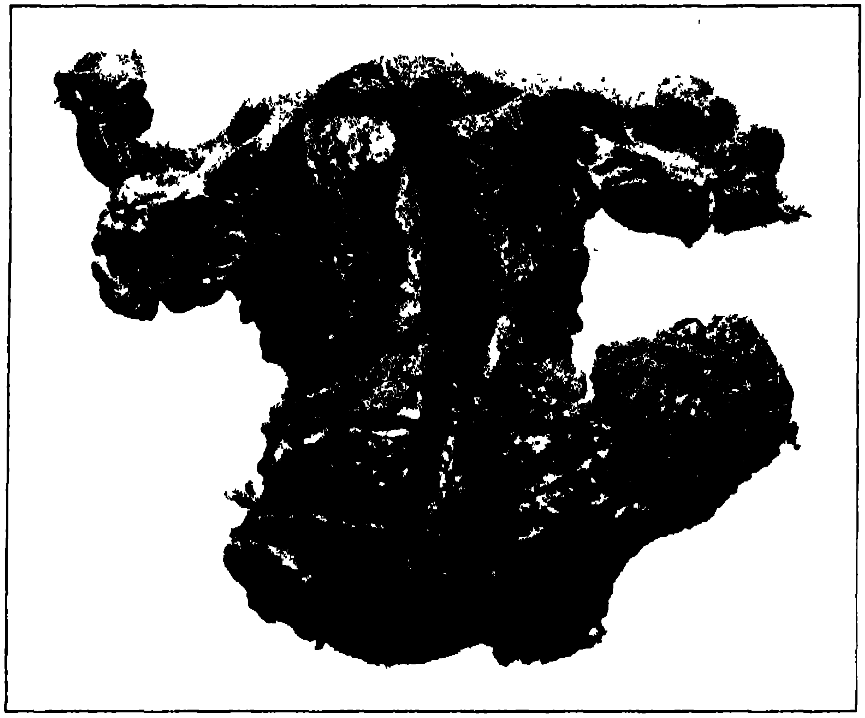

Fig 258.—Cauliflower epithelioma of cervix

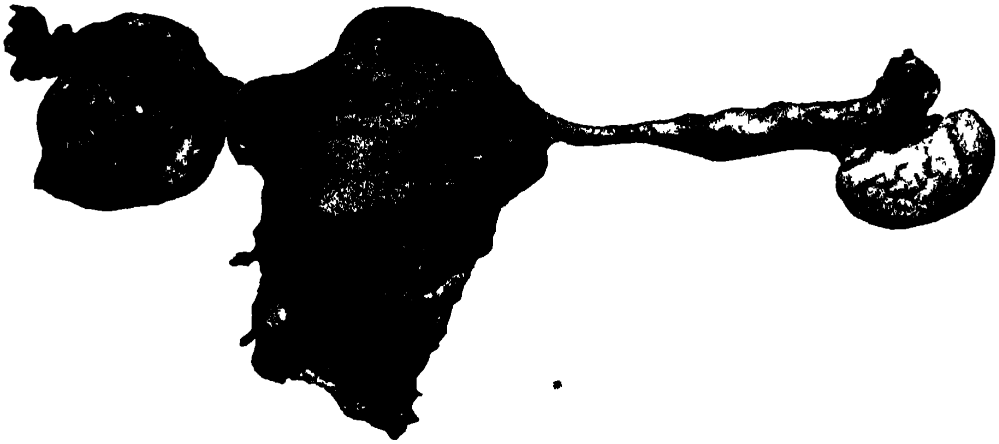

Fig. 259.—Squamous cell cancer of cervix, ulcerative stage.

ant papillomatous growths are detected. The digital examination causes bleeding, as a rule, sometimes quite profuse; the finger-tip at least is stained with blood after the examination.

In later stages the recognition of cervical cancer is easy. A huge cauliflower growth fills the vaginal vault, from which large pieces may be removed by the examining finger, or there is a deep crater-like ulcer with indurated edges occupying the situation of the cervix. If the broad ligaments are involved, they are board-like in feel, fixing immovably the vaginal vaults laterally and the uterus. The involvement of the bladder may be detected by the infiltration of the anterior vaginal wall and subjacent tissues, the history of frequent urination, and a cystoscopic examination in which nodes of cancer may be seen in the vesical mucous membrane. Later a vesicovaginal fistula and incontinence of urine indicate the cancerous ulceration of the bladder-wall.

In an adenocarcinoma of the cervix it may be necessary to insert the forefinger in the cervical canal. Hard nodules and deep fissures are felt; the elasticity of the cervix is lost; the tissue is hard and at the same time brittle; deep ulceration may be detected; bleeding is excited by the examination, and masses of the growth may perhaps be removed by the tip of the forefinger, but it is not so friable as an epithelioma.

The size and condition of the uterus should always be taken into account. If it is enlarged, its cancerous involvement, pregnancy, or pyometra should be thought of. On a specular examination in an early stage of the disease, the enlarged cervix, its indurated appearance, nodules under the mucous membrane, which may be blue in color, glazed and stretched as though ready to burst, indicate an incipient carcinoma. The papillomatous outgrowths a little later are pathognomonic. A large cauliflower mass is unmistakable Extensive ulceration is extremely suspicious, to say the least, for true ulceration of the cervix is exceedingly rare except in cancer. The appearance presented after necrosis has begun is quite distinctive. Large pits in the exuberant mass are seen, lined with yellowish-green pus and necrotic material. In an adenocarcinoma of the cervix the appearance presented in a specular examination may not indicate the true nature or the extent of the disease. The cervix and internal os may appear to be normal. Later the vaginal vault is puckered and irregularly elevated by nodular growths; the os is represented by an irregularly shaped opening or may be invisible. In all cancers of the cervix, the digital is more valuable than the specular examination. In case of doubt as to the nature of a disease of the cervix, a piece of tissue of considerable size should be removed from the most suspicious area for microscopical examination. It is usually better to anesthetize the patient. The tissue to be removed is transfixed with a tenaculum and is cut out with heavy sharp-pointed scissors curved on the flat. If there is good reason to believe the disease cancerous, it is not infrequently more convenient for the surgeon and better for the patient to be prepared for a radical operation, to have a rapid diagnosis of the nature of the growth made by the freezing process, and to perform at once a hysterectomy if the pathologist's report, made within five or ten minutes, is unfavorable.

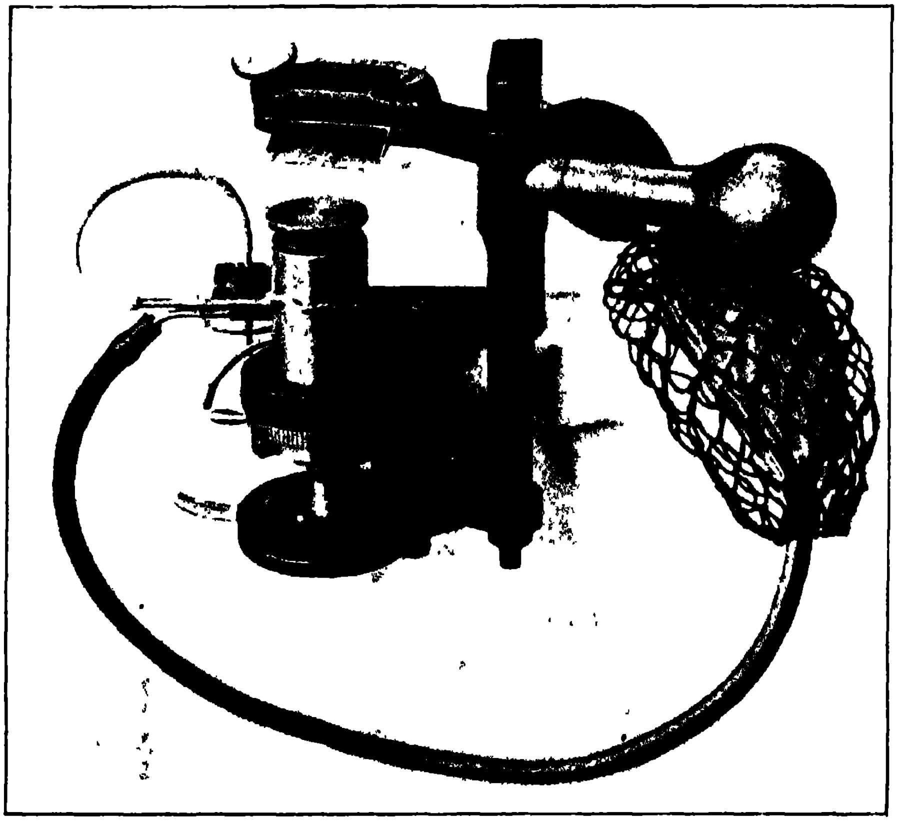

Fig. 260 —Jung-Hobel freezing microtome; ether spray.

Technic of Rapid Diagnosis by the Freezing Microtome.—*Apparatus.*—The apparatus necessary for the work consists of (1) a Jung-Hobel freezing microtome, using the ether spray or the CO_2 apparatus; (2) 5 per cent. formalin solution; (3) a sharp knife with bone or ebony handle; and (4) the usual spatulas, needles, staining fluids, etc., necessary in any microscopical section work

The ether spray has the advantage over the CO_2 apparatus of being much more portable, and more easily regulated. It has the disadvantage that it does not freeze the tissues well in very hot weather.

Certain tissues freeze and cut much better than others. Pieces of cervix, uterus, solid growths, like carcinomata and sarcomata, as a rule cut well On the other hand, it is difficult to get satisfactory frozen sections of endometrium, mucous polyps, or tissue containing a large amount of fat or blood. It is usually necessary to cut such sections thick. Whenever possible, the microtome should be set at 25–30 μ to get the best results.

Technic.—The apparatus is prepared as shown in figure 260. The tissue to be examined is cut into pieces not over ½ inch long, ½ inch broad, by ¼ inch thick. It is better to have them smaller than this, but certainly not larger, as it only adds to the difficulty of freezing. The tissue to be frozen is placed on the platform of the microtome and is held down upon it by pressure with the bone or ebony handle of a knife or other suitable instrument, and the spray is started and kept going by means of the bulb. It is better not to use a steel instrument to hold the tissue on the stage, as the metal absorbs the cold and delays freezing. As soon as the tissue is frozen fast to the stage, the upper part is cut away, leaving a thickness of not over ⅛ inch. The stage is then screwed up by means of the micrometer screw until the knife just touches the tissue. The micrometer screw is then set at the desired thickness and the sections are cut, swinging the knife by means of the handle. The stage is raised the proper distance between each section by the small catch under the handle of the instrument. Probably the most difficult part of the whole procedure is to judge the degree to which the tissue should be frozen This can only be done by practice. When the tissue is frozen too hard, it cuts in ridges; so it should be kept just short of this point, that the sections will cut smoothly. The sections, as they are cut, are wiped off the knife-blade with the finger and placed in 5 per cent formalin solution. They are left in this for three or four minutes, to harden them so that subsequent manipulations will not tear them Then the section to be examined is carefully straightened out on a spatula, stained for one or two minutes in Delafield's hematoxylon, washed for one minute in water, and, if the diagnosis be desired in a hurry, mounted in glycerin and examined. If there be no need of great hurry, three or four minutes extra can be allowed; it is often safer to counterstain the section in eosin and then dehydrate clear and mount in the ordinary way With a little practice, a diagnosis can usually be given in ten minutes from the time the tissue is removed from the patient, or often in an even shorter time. Time can be saved by using concentrated instead of the usual dilute stains. In any case it is necessary to remember that these frozen sections stain more readily and deeply than those hardened in alcohol, and they must be watched accordingly. A frozen section too deeply stained is useless for diagnostic purposes.

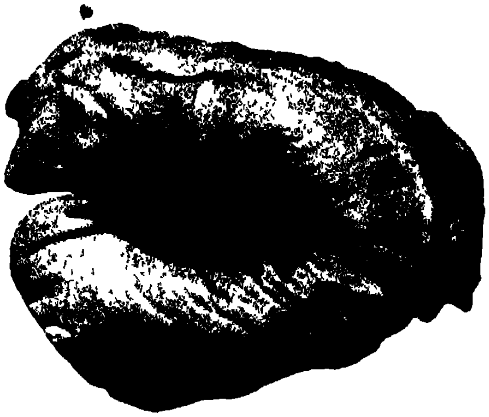

Fig. 261.—Incipient malignant adenoma of cervix, appearing as a small nodule, within the cervical canal.

It may be necessary to amputate the cervix in order to study its condition satisfactorily and to arrive at a correct diagnosis. The incipient adenocarcinoma represented in figure 261 would scarcely have been detected in any other way.

The differential diagnosis of cancer of the cervix and such conditions as cervical tears and cicatricial infiltration, hypertrophy, simple ulceration, ectropion and erosion, polyps, granular inflammation of the vaginal portion, myomata, sarcomata, condylomata, syphilis, and tuberculosis should never be very difficult. Simple ulcers and erosions are not extensive, yield rapidly to local treatment, and there is no infiltration of surrounding tissues. Hypertrophy, old lacerations, and cicatricial infiltration do not cause ulceration. Polyps and myomata are not ulcerated, and are covered with a normal pink mucous membrane or the deeper red membrane of the cervical canal; there is no papillomatous outgrowth and no infiltration of surrounding or subjacent tissue.

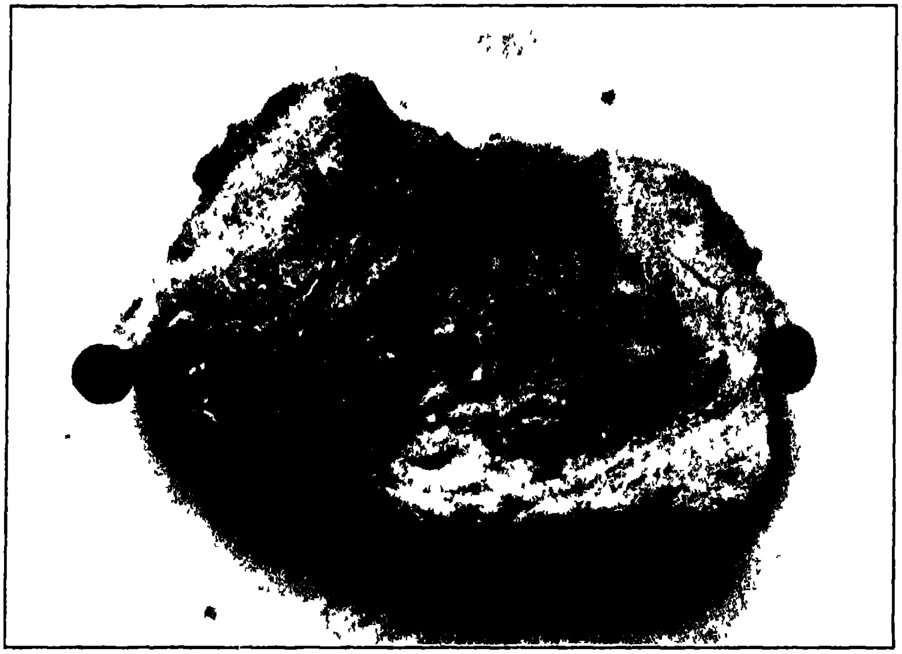

Fig 262.—Malignant adenoma of cervix. Same as figure 261, the cervix laid open.

A sloughing myoma is often mistaken for a cancer, but there is no infiltration around its base, no papillary outgrowths on its surface, and no deep ulceration, although the tissue is friable and can be removed sometimes in large pieces by the finger-tip. The microscopical examination, if necessary, is conclusive

Granular vaginitis has a distinctive appearance not at all suggestive of cancer, not ulcerative in character, affecting the vaginal portion of the cervix and the vaginal mucous membrane, usually due to gonorrhea or occurring in pregnancy, and with no infiltration of subjacent tissue. Condylomata of the vaginal vault and cervix are extremely rare. The author has seen but one case. There is a large papillomatous growth, but the surface is not ulcerated, the color is a light pink, the individual papillomata are separated from one another, the intervening mucous membrane is perfectly healthy, and there is not the slightest infiltration surrounding or underlying the narrow bases of the pedunculated warty masses.

Sarcoma, tuberculosis, and syphilis are not so easily distinguished from cancer. A chancre, syphilitic ulceration, or a gumma either heals spontaneously or yields to specific treatment. A sarcoma may present a distinctive appearance, but a microscopical examination may be necessary to determine its character. It is a very rare growth, and the law of chance is against a malignant tumor of the cervix being of this type.

Tuberculosis has a characteristic appearance and may have the distinctive history of extension from tuberculosis of the uterine cavity or of infection from tuberculosis of the male organ (page 218). The microscope and inoculation experiments may be necessary, however, to arrive at a correct diagnosis. It must be remembered that cancer of the cervix may be associated with tuberculosis of the uterus.

The treatment of carcinoma of the cervix uteri is the complete removal of the uterus with its appendages. If the carcinoma has extended to the peri-uterine connective tissue, the bladder, the vagina, the rectum, and the retroperitoneal lymphatic glands, recurrence is practically certain; therefore palliative treatment only is justifiable to remove the sloughing cancerous mass, to destroy as much of the carcinomatous growth as possible, to postpone the fatal issue, and to afford a comparative euthanasia. Persistent and daring attempts have been and are being made to save patients in whom a cancer has extended beyond the uterus itself, by the removal, along with the uterus, of a portion of the vagina, the bladder, the pelvic lymphatic glands, fat and connective tissue; but the results are not encouraging. An extension of the disease to the vaginal vaults is readily dealt with by their removal with the cervix and uterus, but more extensive involvement and the exsection of neighboring organs and tissues have simply demonstrated the possibilities of modern surgery to eradicate anything but a vital organ without an improvement in the ultimate results of cervical cancer. It is not the extensive but the early operation for the disease that promises better results in the future.

If there is no demonstrable involvement of the broad ligaments, the vesico-uterine pouch and the bladder-wall, the utero-sacral ligaments, the rectum, or the pelvic lymphatic glands, the case is a suitable one for hysterectomy. The uterus is freely mobile, there is no infiltration to be felt beyond the cervix in either a vaginal or a rectal examination, there are no vesical symptoms, and the cystoscope shows no cancerous nodules or ulcerations in the vesical mucous membrane It must be remembered that salpingitis with pelvic peritonitis and adhesions is not uncommon in association with cervical cancer, and that there may be an inflammatory and not a cancerous infiltration of the pelvic connective tissue The former, however, is not so stony hard, is not so extensive, and may appear at a stage of the cervical cancer when involvement of the peri-uterine connective tissue would be unlikely. Mere inflammatory infiltration of the peri-uterine tissue does not contraindicate hysterectomy.

The removal of the uterus being determined upon, the operator may choose a vaginal operation alone, an abdominal operation, or a combined vaginal and abdominal operation. The last is preferable in the majority of cases. It enables one to destroy the infectious character of the cancer for the time, to make the vaginal incisions in the most convenient and effective manner, to separate the attachment of the uterus within the pelvis with the least danger, immediate and remote, of hemorrhage and of injuring or ligating the ureters. It insures the entire removal of the uterine appendages, in which there may be incipient carcinoma, and it gives an opportunity to inspect the organs and tissues within the pelvis and abdomen. In short, the combined vaginal and abdominal panhysterectomy unites the advantages of both and avoids the disadvantages of each method of operating

Panhysterectomy by the Combined Vaginal and Abdominal Methods.—The patient is prepared for an abdominal and a vaginal operation (page 600). She is arranged on the table for a vaginal operation. The cervix is exposed by four vaginal retractors—an anterior, a posterior, and two narrow short-bladed lateral retractors. The cervix is seized with a Landau tenaculum forceps, steadied, and pulled down With a serrated curet and scissors all the cancerous mass that can easily be removed is scraped or cut away. The remainder of the tumor is burned with a Paquelin cautery or an electrocautery point until it is thoroughly charred. By the use of the cautery the sloughing tumor is sterilized and the danger of implantation metastasis or infection is minimized. A circular incision is made in the vaginal vault around the cervix with an electrocautery knife, as far as possible from the cancer. The cervix is pulled down while the surrounding tissues are stripped from it, mainly by a blunt dissection, until the peritoneum and the bases of the broad ligaments are reached. The anterior cul-de-sac is opened by catching the peritoneum with a hemostat and perforating it with the finger-

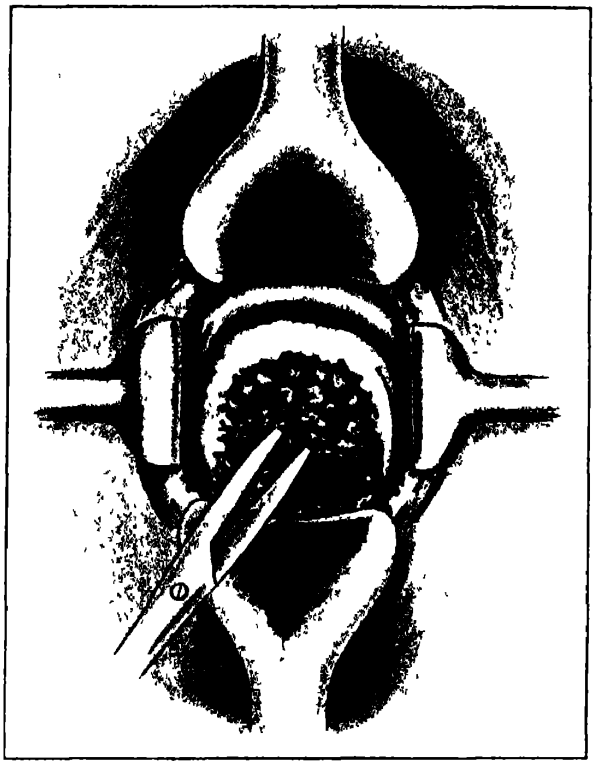

Fig. 263.—Incision around the cancerous cervix for the removal of the uterus.

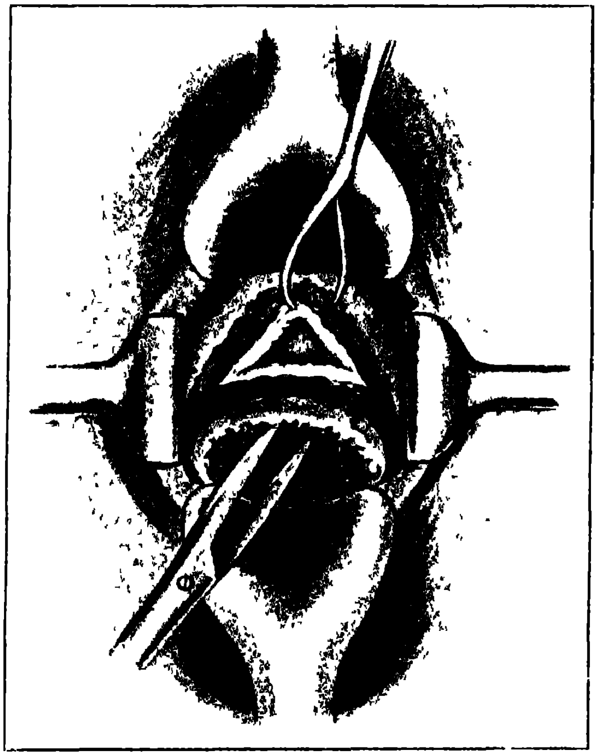

Fig. 264.—Opening the peritoneum of the vesico-uterine pouch.

tip or the point of a scissors between the hemostat and the uterus. The peritoneum is then torn or cut to the anterior surfaces of the broad ligaments. The posterior cul-de-sac is opened in the same way between a hemostat placed close to the rectum and the uterus, and the opening is enlarged to the broad ligaments. The vagina is packed with gauze, the instruments used in the vaginal operation are laid aside, the operator and his assistants change their gloves. The patient is arranged on the table for an abdominal section. The abdomen is opened in the median line by a long incision The fundus uteri is seized with tenaculum forceps and pulled to one side. The ovarian artery and the round ligament on the opposite side are ligated with silk ligatures. A clamp is placed on the broad ligament above the ligatures so that its whole width is included. A hemostat is fastened to the broad ligament just above the ligature on the ovarian artery, and the broad ligament is cut with scissors between the hemostat and the clamp until the round ligament is severed. The uterus now being forcibly drawn to the opposite side, the incision made in the vaginal operation through the anterior cul-de-sac is lengthened by a cut through

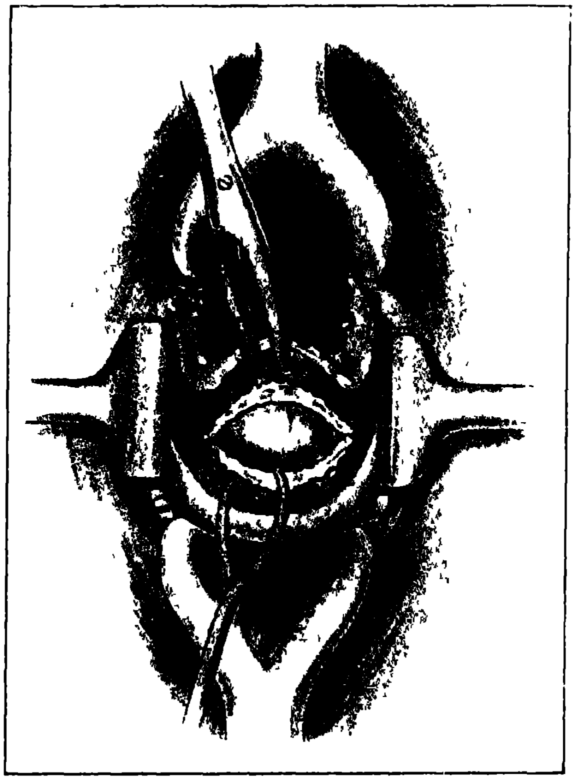

Fig 265.—Opening the posterior cul-de-sac.

the peritoneum to join the incision through the broad ligament which has severed the round ligament. By a blunt dissection of the peritoneal flap on the anterior base of the broad ligament the ureter and the uterine artery may be exposed. The artery may be ligated on the outer side of the ureter, if it is desired to remove as much of the connective tissue around the cervix as possible, and it is always well to do so The artery is cut on the distal or inner side of the ligature and the lateral attachments of the cervix are severed The same procedure is carried out on the opposite side, whereupon the uterus is freed and lifted out

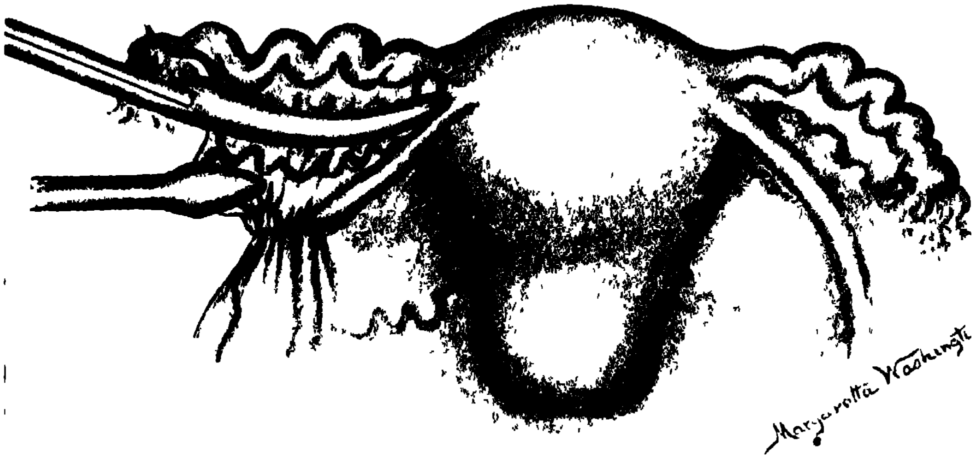

Fig. 266.—Ligation of ovarian artery and of round ligament.

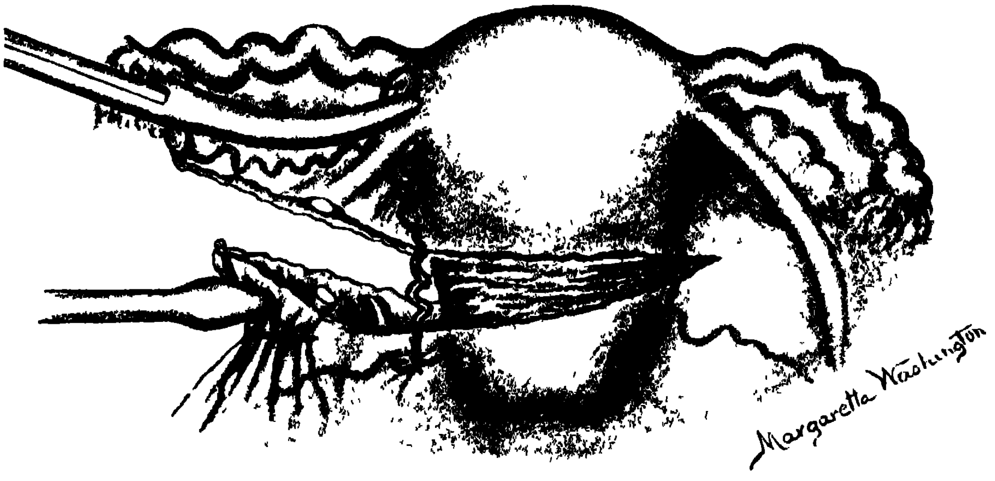

Fig 267 —Incision of broad ligament and ligation of uterine artery in combined hysterectomy.

of the abdomen. An examination is made of the iliac lymphatic glands. They are not likely to be enlarged if the case is an operable one. If they are, they should be removed by slitting the peritoneum over them upon a grooved director and carefully dissecting them out with the greatest care not to injure the important blood-vessels upon which they lie.

It is a moot question whether the lymphatic glands should always be removed, as in the operation for cancer of the breast. It has been enthusiastically advocated and uniformly practised by a few operators recently, but it is too soon to judge of the results. So far as our present knowledge goes, when the lymphatics are involved there is sure to be a recurrence, and the case is really inoperable; but any attempt to improve the ultimate results of hysterectomy for cancer of the cervix seems justifiable in the present unsatisfactory status of the operation.

It is urged by Kelly and his followers that the insertion of bougies into the ureters is a desirable prerequisite to hysterectomy for cancer by any method, and in selected cases it is well worth remembering; but it is not really necessary if the disease has not extended beyond the cervix, it has not always been possible to catheterize both ureters in these cases, and the presence of bougies in the ureters has not prevented their ligation or inclusion in a clamp.[1]

After the removal of the uterus and the examination of the pelvic lymphatic glands, the posterior and anterior vaginal walls are united with two or three interrupted catgut sutures, the peritoneum attached to the bowel is united to that attached to the bladder by a few interrupted catgut sutures. The abdominal wound is closed. The vaginal packing is then removed, as it has been soaked with blood, and is replaced with fresh gauze, which is removed in forty-eight hours.

An important modification of this technic has been recently advocated and practised by A. J. Downes. Instead of ligatures on the vessels of the broad ligament, the whole broad ligament is compressed and cooked by the Downes electrothermic angiotribe (page 589). Outlying nests of cancer cells are thus likely to be destroyed.[2]

Vaginal Hysterectomy.—The vaginal method is preferable if the woman is very fat, if the operation promises to be particularly easy and rapid, and if the patient's condition is not good.

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[1] Cullen, *op. cit.* Both accidents occurred in Kelly's clinic in spite of bougies in the ureters

[2] I have used this method in both carcinomata and sarcoma of the uterus and like it. It promises more, I think, than any recent modification of the technic of hysterectomy for malignant disease. It is somewhat safer, or at least gives the operator a sense of security to expose the ureter and to ligate the uterine artery. The cautery clamp is then applied to the inner side of the ureter and the ligature. The ovarian artery may be safely trusted to the electrothermic pressure and requires no ligature.

The woman is always prepared for an abdominal section in case of unforeseen difficulties in the vaginal operation which might necessitate opening the abdomen.

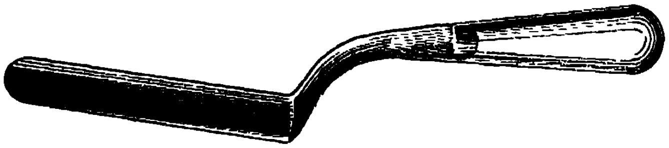

Fig. 268.—Ecarteur, for distending the wound and guarding the ureter.

The first steps of the operation are the same as those described in the combined method. After opening the anterior and posterior cul-de-sac and freeing the lateral attachments of the cervix up to the uterine artery, the uterus is cut in half by inserting one blade of a strong straight-bladed scissors in the cervix and placing the other upon the anterior surface of the uterus, as the uterus is cut it is pulled downward by tenaculum forceps fastened to its anterior surface on both sides of the median line, which are shifted upward until the fundus appears in the vagina through the opening in the anterior cul-de-sac; meanwhile Landau's ecarteurs are inserted in the pelvic cavity and are pressed upward and outward by assistants, to crowd the ureters out of the way. When the fundus is reached, the scissors cut the posterior uterine wall from the fundus toward the cervix, the blade originally inserted in the uterine cavity still remaining there until the uterus is completely divided. One-half is allowed to retreat within the pelvic cavity. The other is held firmly, fundus downward, by a forceps. The ovary and tube on this side are freed if they are adherent, and are pulled inward and downward, exposing the free edge of the broad ligament and the infundibulopelvic ligament. A strong clamp is then fastened firmly upon the broad ligament, including the ovarian artery Another is placed to the inner side of the first, its point reaching beyond the round ligament; a third clamp on the inner side of the second includes all the tissues attached to the lateral surface of the uterus, its points projecting beyond the free inferior border of the structures separated from the cervix in the original circular incision in the vaginal vault, the operator's forefinger guarding the points of the clamp as it is closed as tightly as possible The half of the uterus thus secured is cut away by scissors, which completely sever the broad ligament and connective tissue on the inner side of the clamps The other half of the uterus, hooked down by a finger or pulled down by forceps, is turned

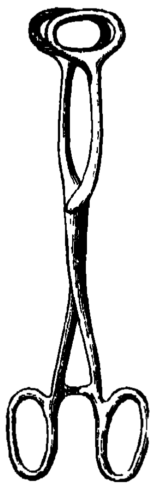

Fig 269 —Forceps for catching and delivering an ovary.

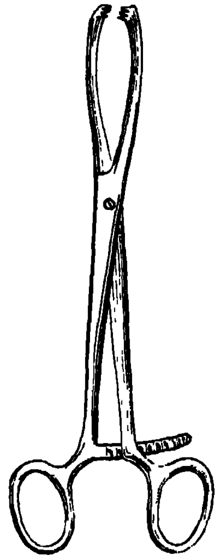

Fig. 270.—Catch forceps, open.

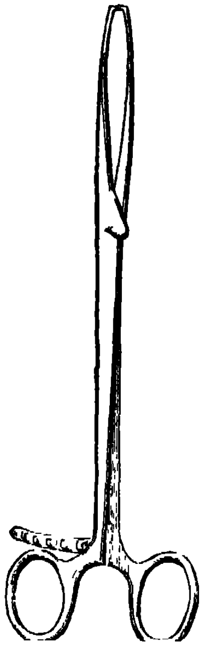

Fig 271.—Catch forceps, closed

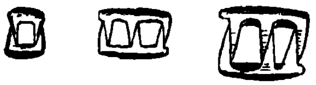

Fig. 272.—Teeth of the catch forceps.

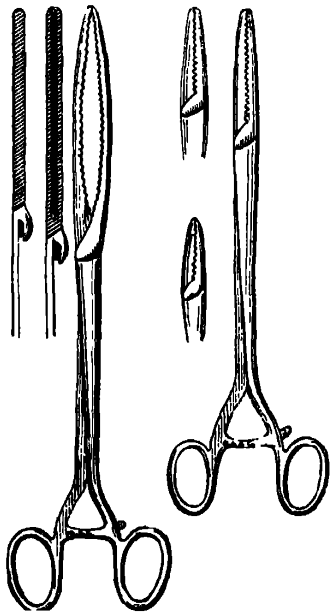

Fig. 273.—Clamps for the broad ligament.

upside down by traction on the fundus; the tube and ovary are brought down as before, the clamps are applied to the broad ligament, and the second half of the uterus is removed as was the first.[1] If there is a tendency to prolapse of the intestines through the open vault of the vagina, a strip of gauze is lightly packed in the opening, being pushed beyond the cut surfaces of the ligaments. The field of operation is carefully surveyed for a minute or two to detect hemorrhage. If a bleeding point is observed, it is clamped with a hemostat or a short-bladed forceps. If packing has been inserted beyond the clamps, it is removed. A fresh strip of gauze is then lightly packed into the opening, extending a short distance beyond the clamps, to protect the intestines and to prevent their prolapse. A second strip of gauze is packed into the vagina between the clamps; a third is placed gently between the latter and the vaginal walls, to prevent their being bruised or wounded by the shanks of the instruments. The

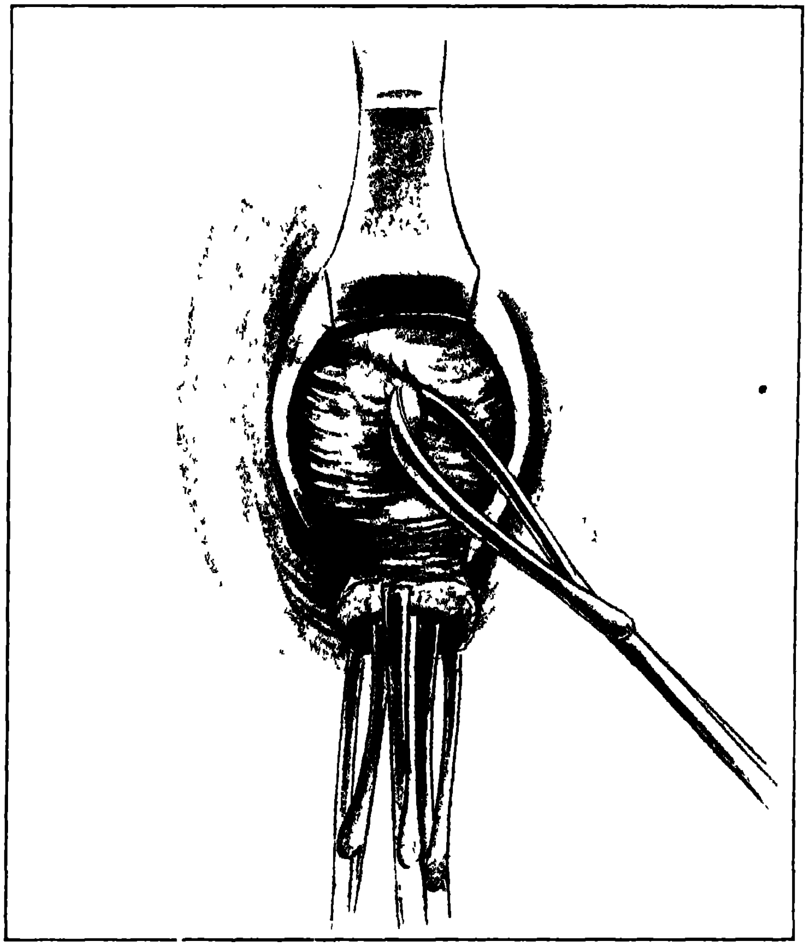

Fig 274 —Uterus delivered from the pelvis (Landau).

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[1] The operator should not be satisfied with the common custom of leaving the tubes and ovaries behind in a vaginal hysterectomy It has been demonstrated that they may contain incipient nodes of cancer.

handles of the forceps projecting from the vagina are enveloped in a sheet of gauze and are further supported by a towel folded around them and pinned to the abdominal binder in the shape of a sling. Pryor's forceps with detachable handle are often most convenient.

The greatest care must be exercised, in transporting the patient to her bed, not to subject the clamps to any violence or traction, which might pull them off the broad ligaments. When the patient is placed upon her back in bed, a folded towel is slung around each thigh just above the knee, both ends being pinned to the bed sheet on the outer side of the legs, thus holding them apart and flexed. The vaginal packing, the pelvic packing, and the clamps are left undisturbed for forty-eight hours, the patient meanwhile being catheterized every eight hours and powdered boracic acid being dusted thickly upon the gauze enveloping the forceps handles, and upon the external genitalia.

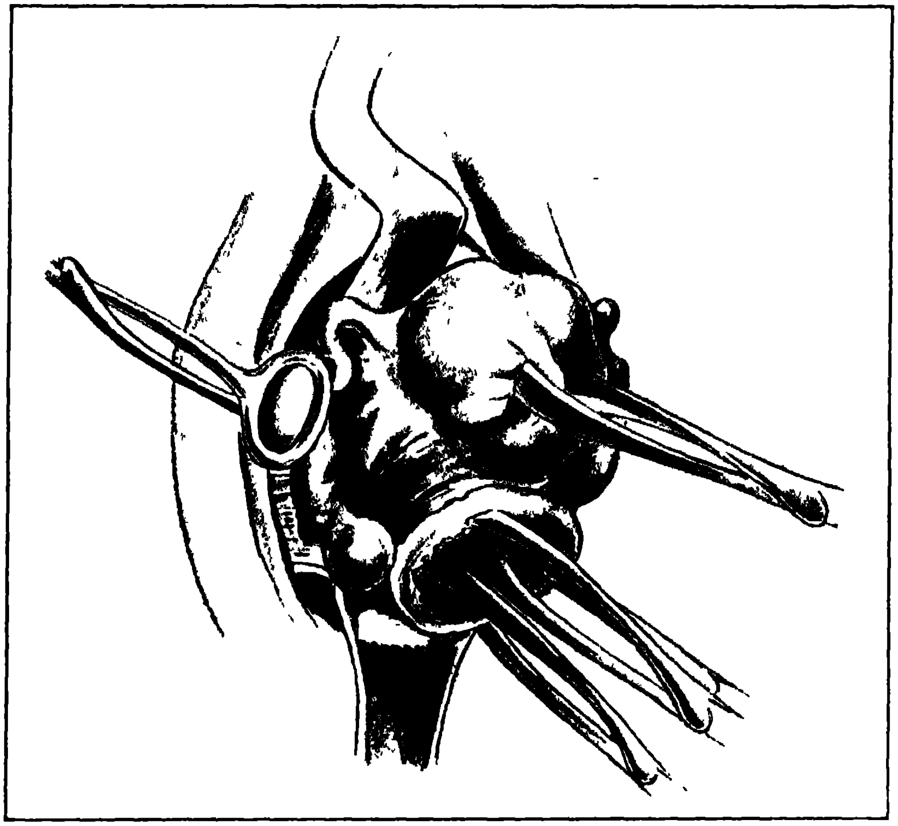

Fig. 275.—Uterus with appendages pulled out of the vulva (Landau)

To unfasten and remove the clamps, the gauze around their handles, the strip in the vagina, and that between the instruments and the vaginal walls are first removed. The catches of all the clamps are then unfastened and the handles gently separated a little. Cautious traction is made first upon one and then another until it is discovered which comes most easily first. After the removal of the clamps, the gauze strip in the pelvis is extracted if it comes away easily; if not, it is left another day or two. A fresh packing is inserted in the vagina to, but not through, the vaginal vault. Landau's ecarteurs are very convenient for this purpose, used as vaginal retractors, one blade on the anterior, the other upon the posterior wall. The bowels are opened on the third day. The vaginal packing is renewed daily. Vaginal douching may be ordered after the first week. The clamp method is preferable to ligatures in a vaginal hysterectomy. The latter are much more difficult to apply and give far less security against hemorrhage. They are likely to slip even if well applied, and there is constant danger of secondary hemorrhage. They should only be used in case of prolapse of the uterus in which the operation

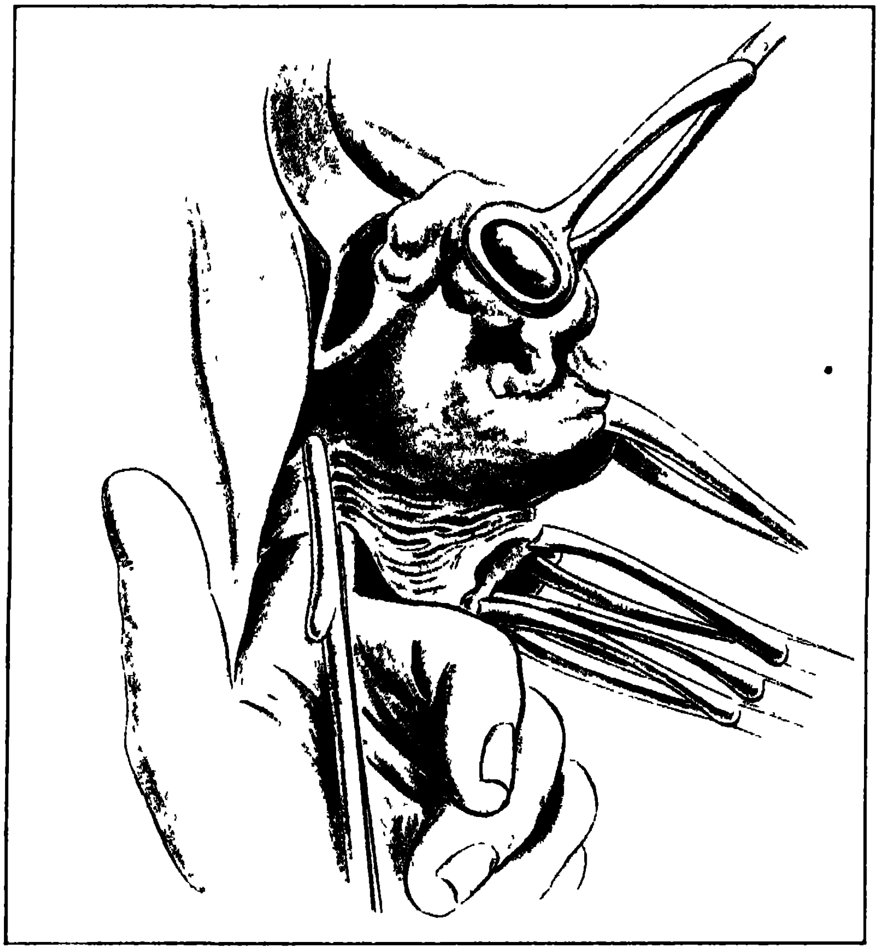

Fig. 276 —Securing the uterine artery with forceps (Landau).

is conducted outside the woman's body and the ligatures are applied in the same manner, with as much security and convenience as in an abdominal operation.

Two other operations for cancer of the cervix merit description *Werder's operation* is thus described by himself:

"The patient having been anesthetized, the whole vaginal portion was very easily removed by a sharp spoon curet, as it was completely broken down by the disease. The remaining bleeding surface was seared over with the thermocautery. The patient was then prepared for laparotomy. Both ovaries and tubes were found adherent, and the left tube distended with about an ounce of creamy pus. After the ovarian arteries were secured, the bladder was separated not only from the uterus, but also from the broad ligaments on either side as far as possible, so as to get the uterus out of the way This opened up both broad ligaments, and the uterine arteries could be easily traced over to near the pelvic bones, where they were tied without difficulty. An

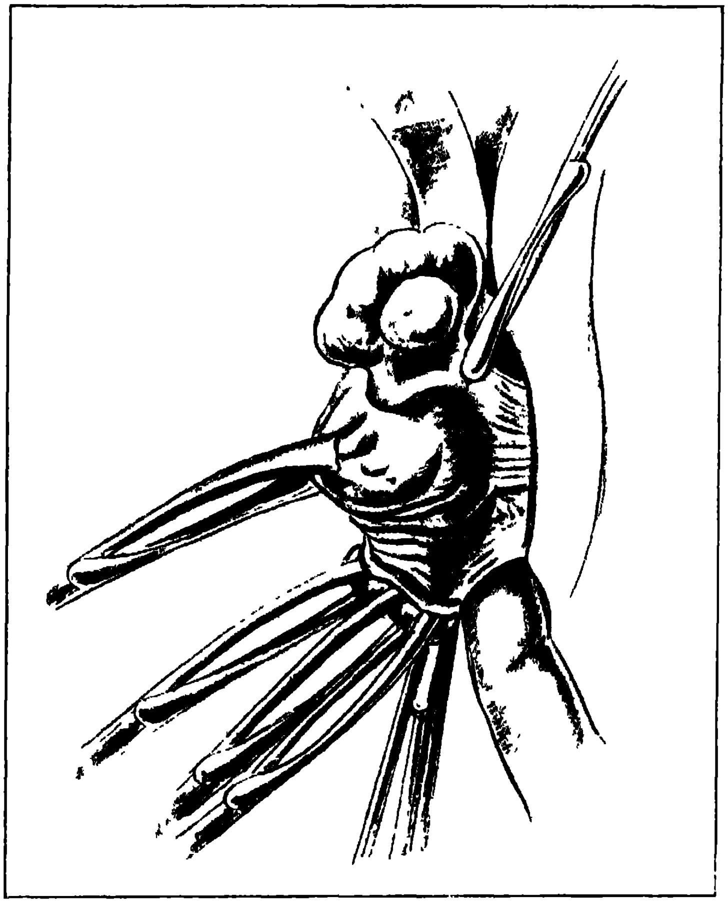

Fig 277.—Securing the ovarian artery on the left side with forceps (Landau).

assistant having inserted two fingers into the vagina as guides, the dissection between bladder and vagina was then carried down to within about an inch of the vulva. The sacro-uterine ligaments were then divided with scissors, the rectum was separated from Douglas's pouch, and with two fingers the dissection extended down to the lower half of the vagina. The lateral walls of the vagina were then freed from their attachments. The uterus and vagina were now only held by the base of the broad ligaments, which were very firmly bound to the vaginal fornices, the separation of which formed the only really difficult part of the operation This having been accomplished and the broad ligaments completely divided, the finger could be passed all around the uterus and vagina, and at no place had the vaginal tube been opened. The loss of blood during the whole operation was insignificant. The uterus and vagina were then pushed down into the pelvic outlet, and the bladder, with its peritoneal flap drawn across the pelvic cavity, stitched over the rectum to the posterior wall of the pelvis, thereby completely shutting off the pelvis from the general peritoneal cavity, and covering up all raw surfaces with peritoneum. The abdomen was closed in the usual manner. The operation having been done in the Trendelenburg posture,

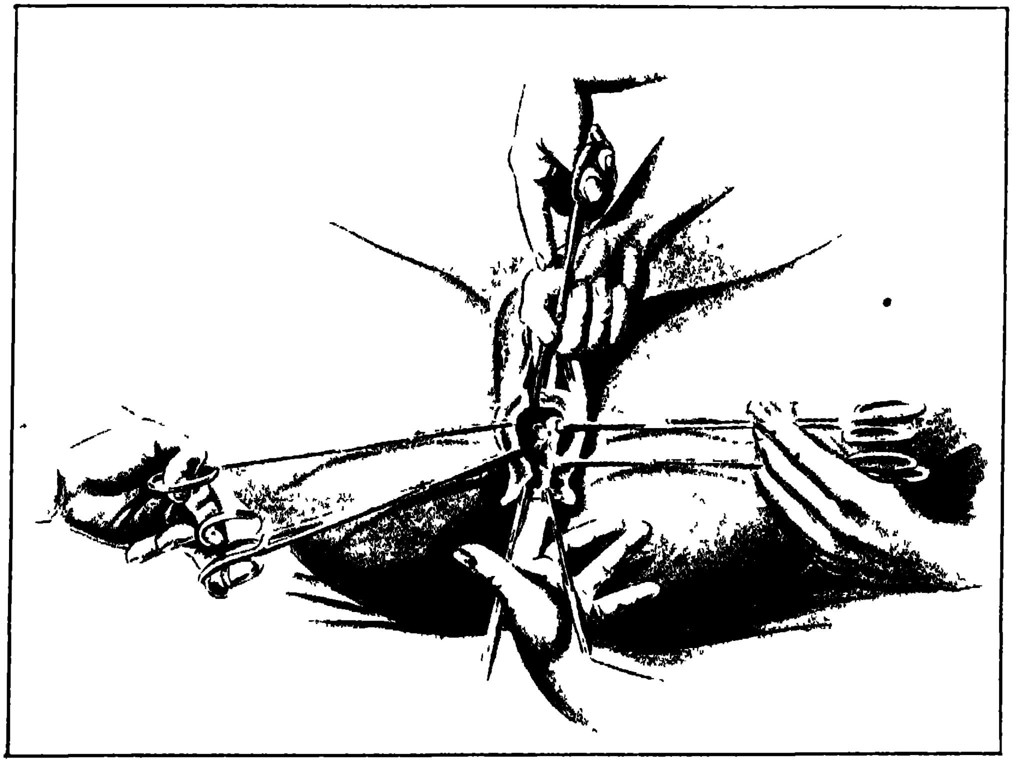

Fig 278.—Anterior wall of uterus split with scissors (Landau).

the patient was now replaced into the ordinary lithotomy position. The uterus, which was protruding at the vulva, was seized with volsella forceps and drawn completely out of the vulvar orifice with the inverted vagina. With the finger in the rectum and the sound in the bladder as safeguards against injuring these organs, the inverted vagina was amputated with the thermo-cautery. An inspection of the pelvis showed a large raw cavity, lined in front and above by the bladder, behind by the rectum, about four inches of which was completely exposed, and below by a very short vagina. The cavity was lightly packed with gauze. Duration of operation two hours. Examination of the pelvis on the tenth day showed a very small cavity above the remaining vagina covered with healthy granulations, in which the bladder and rectum were no longer recognizable. The operative technic I found much easier than I had anticipated, and not more difficult than a total abdominal hysterectomy. After a little experience I think it should not consume more time than the latter operation. I would suggest the use of rubber gloves for the preliminary curetment, to keep the hands aseptic, and to avoid

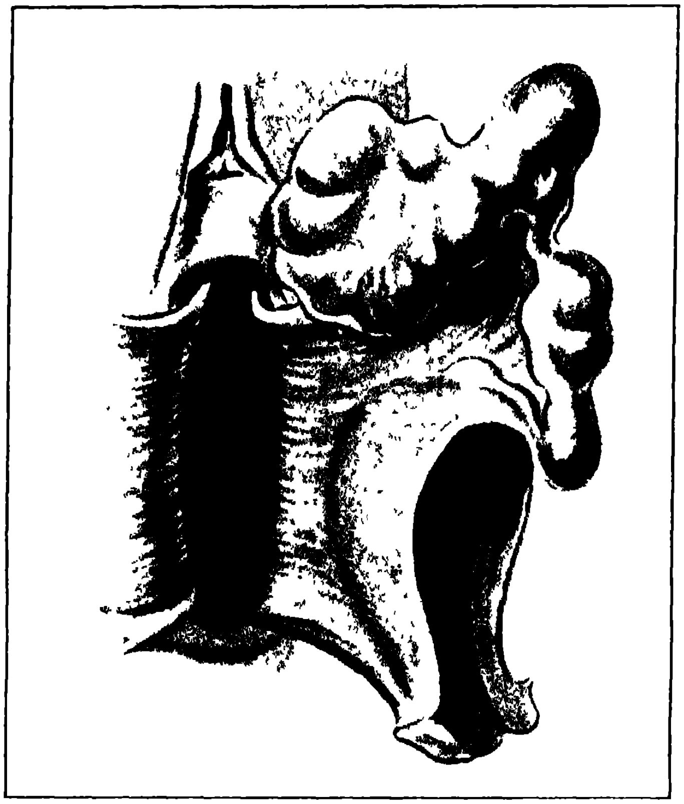

Fig 279.—Half of the uterus, after its division, delivered from the vulva, and ready for the application of forceps to the broad ligament (Landau).

contact with cancerous tissue, thereby not only preventing any danger of septic contamination, but also excluding with absolute certainty the possibility of inoculation."[1]

Byrne's operation is thus described by its author:

"A diverging volsella, after being passed well into the cervical canal, should be expanded to a proper degree and locked, so as to afford complete control of the uterus during the entire operation. By alternate traction and upward pressure of the uterus, an accurate idea may be obtained as to the proper point to begin the circular incision, so as to avoid injuring the bladder or opening into the cul-de-sac of Douglas. As to the latter, however, should it be found that the disease has involved the retro-uterine tissues, and that its excision or destruction by the cautery cannot be effected without opening into the peritoneal cavity, there

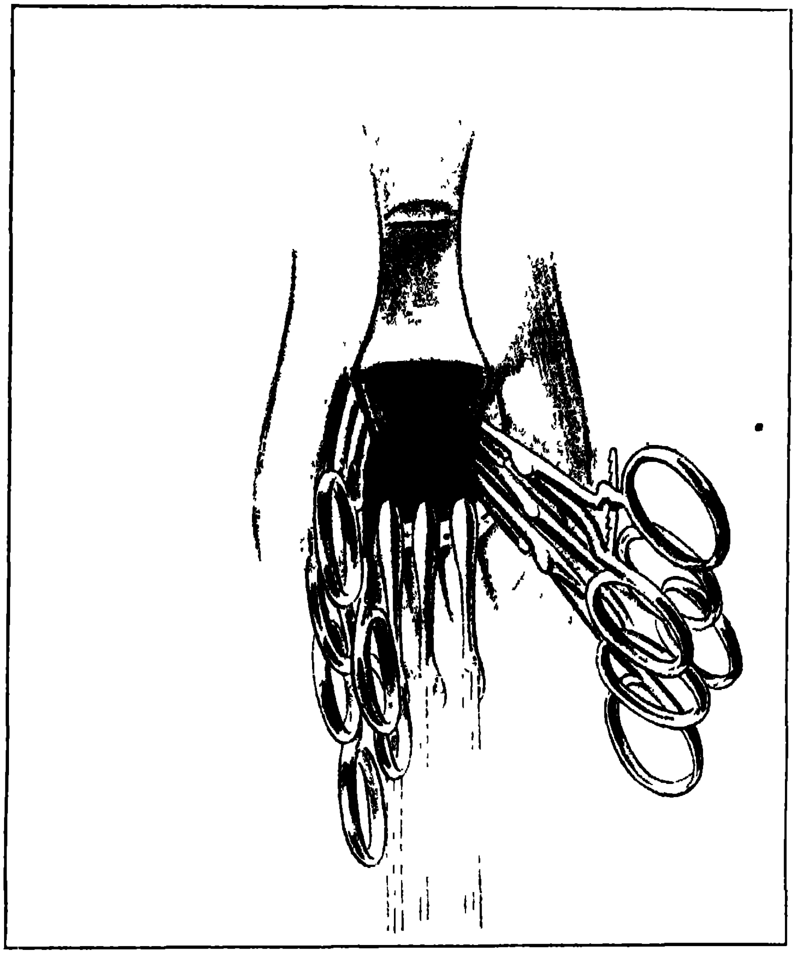

Fig. 280 —Distending and holding open the wound with hemostats and the ecarteur (Landau).

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[1] "Amer. Jour. of Obstet," vol. xxxvii, No 3, 1898.

need be no hesitation in doing so. I have never known any harm to come from it whether it was done accidentally or by design. Should it be evident at the outset that the operation, in order to be thorough, must include a portion of the cul-de-sac, it will be better to make the line of incision anterior to this, until the cervix has been removed, and leave the incision of the retro-uterine parts by the cautery knife to be the final procedure.

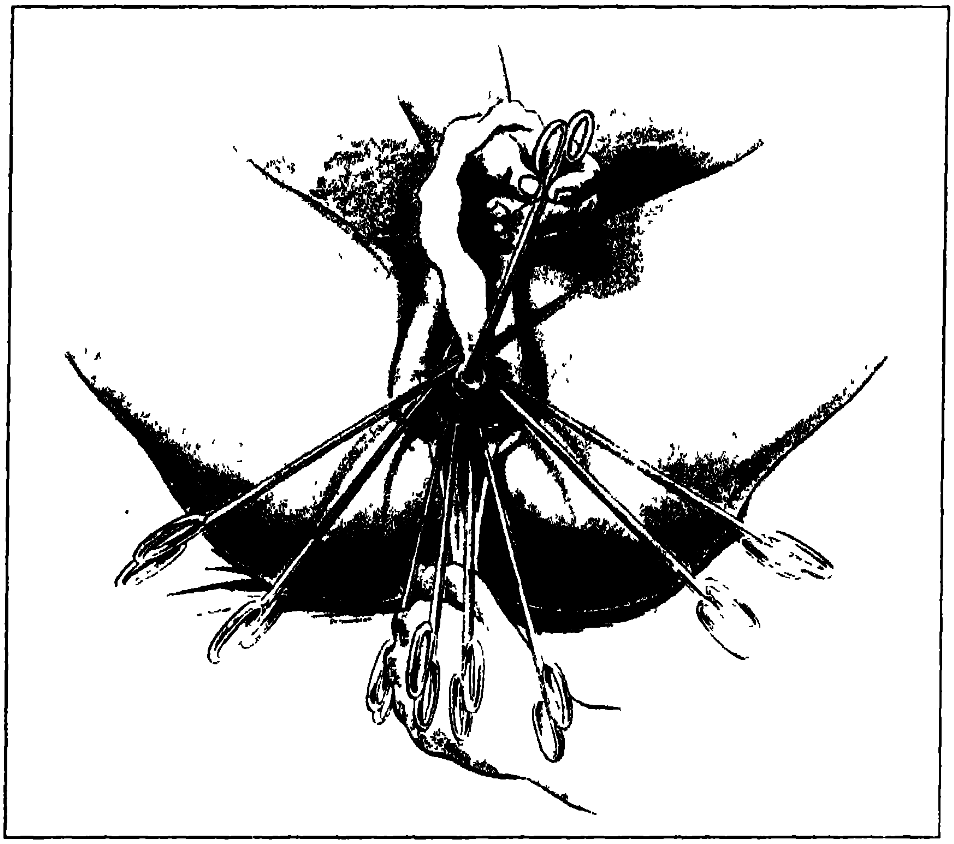

Fig 281.—Inserting a gauze strip to tampon the wound (Landau).

Under these circumstances all that will be needed will be an antiseptic tampon properly applied. In proceeding to make the circular incision, the cautery knife, slightly curved and cold, should be applied close up to the vaginal junction, and from the moment the current is turned on, should be kept in contact with the parts being incised Before removing the electrode for any purpose, such as change of position or altering the curve of the knife, the current should first be stopped and the instrument again placed into position while cool before resuming the incision. In other words, if the knife, though heated only to a dull red, be applied to parts at all vascular, hemorrhage more or less will certainly follow; whereas, the cool platinum blade being already in contact with moisture as the current is being transformed into heat, vessels are shrunken or closed even before they are severed. This is a very important point and should never be lost sight of in all cautery operations. The circular incision having been made to the depth, say, of a quarter of an inch, it will now be observed that by increased traction the uterus may be drawn much farther downward, and by directing the knife upward and inward the amputation may be carried to any desired extent. In cases calling for amputation above the os internum, it will be better to excise and remove the cervix first; then, by dilating the upper canal sufficiently to admit the diverging volsella, once more proceed as in the first instance, taking care, however, to keep within bounds It will be found that the cupped stump can now be drawn down and made to project as a more or less convex body. In all cases the dome-shaped electrode should be passed over the entire cavity repeatedly so as to render the cauterization still more complete. It is important to add that, in carrying the knife toward the sides of the cervix, circular and other arterial branches are likely to be encountered, and hence, in this locality particularly, a high degree of heat in the platinum blade is to be carefully avoided. As an additional security against hemorrhage, the convexity of the knife should be pressed against the external surface of each particular section cut, so as to close the vessels more effectually It is well to state that the metallic parts of the electrode for the distance of about two inches should be covered with a strip of thin flannel, so that the vagina may be protected from injury through the reflected heat.

"I stated that in 40 out of 63 cases of cancer of the portio vaginalis (23 having strayed away) periods of exemption from relapse were obtained ranging from two to twenty-two years, being an average of over nine years for each; and of 50 out of 81 cases involving the entire cervix (31 being lost sight of), 10 had an exemption from recurrence for over two years, 11 over three years, 6 over four years, 8 over five years, 6 over seven years, 2 over eleven years, 1 over thirteen years, and 1 over seventeen years. Nor is this all, for the table would now bear important reconstruction—no less than 6 of these cases, and probably many more, having until now enjoyed a complete immunity. Moreover, one patient operated on in 1875, and a most unpromising case, too, and who could not be found at the time of my report, has since been discovered by Dr. Homer L. Bartlet, of Flatbush, with whom I saw her, and who was present at the operation. Two months ago, or nearly twenty-one years after the operation, she was in perfect health."

The Prognosis of the Operative Treatment of Cancer of the Cervix Uteri.—A recurrence of the cancer after its removal by hysterectomy has hitherto been at least the rule. The growth recurs in one of four ways: (1) In or about the scar of the vaginal wound; (2) in the lymphatic glands; (3) by metastasis in distant organs; (4) in the neighborhood of the field of operation by an implantation metastasis.[1]

Local or wound recurrence is almost the invariable rule. A number of observers have found in the microscopical study of uteri removed for cancer of the cervix an extension of cancer cells laterally or posteriorly in fine ray-like growths, only apparent under the microscope. Outlying nests of cancer cells may be discovered with apparently healthy tissue intervening between them and the parent growth. The operator, therefore, often leaves cancerous tissue behind, although he makes his incisions in structures apparently healthy and provides a wide margin between his incisions and the cancer. The large majority of specimens examined show this result.[2] The discouraging proportion of recurrences after the radical operation for cancer of the cervix is therefore not strange. A recurrence of cancer in the lymphatic glands is rare. The lymphatic ducts of the upper vagina and of the cervix run along the bases of the broad ligaments and then upward to the iliac glands, situated just below the iliopectineal line, in front of the sacro-iliac synchondrosis, and in the fork of the great iliac arteries, where they divide into the internal and external branches. The ducts of the uterine fundus follow the ovarian arteries in the upper edges of the broad ligament and then run upward to the lumbar retroperitoneal glands in front of the aorta. A subordinate system of small ducts runs from the uterine cornua along the round ligaments to the glands in the groins. The iliac lymphatic glands, therefore, are the seat of lymphatic involvement in cancers of the cervix, but they are not often affected. In two-thirds or more of the fatal cases the iliac glands are found free from disease at the postmortem examination.

A recurrence of cancer of the cervix by metastasis in a distant organ is quite exceptional. In 202 cases Winter found metastasis in 9—2.5 per cent. That implantation metastasis is possible is shown by experiments upon animals and human beings and by clinical observation. The possibility must be borne in mind and guarded against in the operative technic, but recurrence of a cervical cancer in this manner is the rarest of all. There is a wide divergence in the actual results secured by the radical treatment of cancer of the cervix. Byrne's statistics have already

[1] Winter, *op. cit.*

[2] Frommel, in Veit's "Handbuch," vol. 3^1.

been cited. Richelot claims 10 per cent. of cures; Winter, in the operations of the Berlin Frauenklinik prior to 1892, 30 per cent.; Olshausen, 18 per cent.; Schauta, 31 per cent.; Kaltenbach, 14 per cent.; Fritsch, 36 per cent.; Leopold, 53 per cent. Jacobs, in 82 vaginal hysterectomies, saw a recurrence in every one within a year, and all the patients are now dead. Baldy and Robb claim that less than 5 per cent. of cancers of the cervix are permanently cured by the radical operation. In Kelly's clinic, of 75 cancers of the cervix, only 5 per cent. are permanently cured. Noble, in 23 cases of hysterectomy for cancer of the cervix, is able to report 3 without recurrence after five years.[1] The author has had 44 vaginal and 11 combined hysterectomies for cancer of the cervix, with 4 deaths from the operations. Four of these patients are known to be alive after five years. All the rest are dead from recurrent growths, too recently operated upon to be regarded as cured, or unheard from. The prognosis depends largely upon the stage of the cancer at the time of operation. There is a period when all cancers of the cervix are probably curable, but unfortunately this period is usually past when the operator first sees the patient. The more ignorant the patient, the less likely she is to apply for medical aid in time. In the author's fifteen years' gynecological service in the Philadelphia Hospital there have never been less than 3 patients in the cancer ward; often many more Of the 75 or more cases of cancer of the cervix in that institution under the author's care, there has been but one operable case, and that woman positively refused operation

Recurrence after the removal of a cervical cancer is usually observed within the first three years; it is uncommon between the third and fifth year, and is very rare after five years. It has, however, been observed at the end of twelve years (Olshausen). Nodes are felt in the vaginal scar, or may be made out by a rectal examination in the bases of the remnants of the broad ligaments The recurrence may take the form of cancerous infiltration of the pelvic connective tissue, with a firm mass extending laterally and posteriorly like a pelvic inflammatory exudate. If the iliac lymphatic glands are involved, they may be felt by deep abdominal palpation in an examination under anesthesia, as hard, movable nodules. A serosanguinolent vaginal discharge appears, and the later ulcerative stages of the disease have many of the same clinical features that are presented by an advanced inoperable cervical cancer.

Granulation tissue around a silk ligature or the inclusion of one end of a Fallopian tube and pouting of its mucous membrane may suggest a recurrence of cancer, but there is no exuberant growth, no friability of the tissue, and no infiltration around the suspected area. A microscopical study of a fragment of tissue removed for the purpose is conclusive.

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[1] "Phila. Med. Jour.," Nov. 9, 1901. I am indebted to Dr. Noble's article for the foregoing statistics

The Palliative Treatment of Cervical Cancer.—If the case is inoperable the patient may often be made comfortable for some months at least, and her life may be prolonged by removing or destroying as much of the cancer as possible and by the *x*-ray treatment. The exuberant growth is scraped away with a serrated curet; portions of it too solid to be removed by the curet may be cut off with scissors The hemorrhage may appear formidable at first, but it grows less as the redundant tissue is removed. There is always danger of opening Douglas's pouch or the bladder in this operation. The former accident has no serious consequences and need give the operator no concern. The latter, however, should be carefully avoided, as the vesicovaginal fistula makes the patient more miserable than she was before the operation. The raw surface remaining usually in the shape of a deep pit in the vaginal vault is thoroughly charred with a Paquelin cautery or an electrocautery point, the vaginal walls being protected by four retractors or by a short cylindrical speculum of wood or hard rubber. The vagina is washed out with a douche of sterile water and is well dried. The walls are coated with an ointment of one part sodium bicarbonate and three parts ung petrolei. A tampon of cotton large enough to fill the cavity of the cancer is moistened, but not soaked, with a 50 per cent. solution of chlorid of zinc and is placed in the cavity left by the curetment. A string is tied to it to facilitate its removal. The vagina is packed with a strip of gauze smeared with the bicarbonate of sodium ointment, which will neutralize the zinc solution and prevent an ulceration of the vagina which might otherwise be serious. The gauze is removed at the end of forty-eight hours. The zinc chlorid tampon is allowed to remain eight or ten days, when it may be removed by gentle traction on the string, often bringing with it a large slough of cervical tissue. The improvement in the patient's condition is often astonishing. The cachexia disappears; she regains color, weight, and strength; the vaginal discharge ceases. She may obtain a respite from her former symptoms for months and even years. The author has seen a patient remain comfortable after this treatment for three years. Usually, however, the symptoms of ulceration and sloughing return in about six months. Deodorant douches of permanganate of potassium and of creolin must then be ordered. Pelvic pain of an excruciating character may appear. The patient should be encouraged to become an opium eater until she obtains comparative comfort.

After a radical operation periodic examinations should be made. If there is a recurrence, the cancerous nodules accessible in a vaginal examination may be cauterized by local applications of zinc chlorid, but the best treatment is the application of the Roentgen ray.

The Roentgen and the Finsen Rays for Inoperable and Recurrent Cancers of the Cervix.—It is too early to decide what the ultimate results of the *x*-ray treatment of cancer of the cervix will be. A cure can hardly be expected, but there is no doubt of the enormous symptomatic relief afforded. Hemorrhage often ceases, the discharge diminishes or disappears, pain is relieved, and a patient practically bedridden may be restored to an active life.

In the clinic which has been established for the treatment of these cases in the Howard Hospital, the patient is placed on a gynecological table in the dorsal position. The thighs, vulva, and mons veneris are protected with zinc foil A large caliber, short Ferguson's cylindrical speculum is inserted in the vagina, exposing the cancerous area. The *x*-ray tube is held some four or five inches away from the vulva and the depth of the canal is exposed to the rays for eight to ten minutes. The treatment is applied four to six times a week.

Charles Lester Leonard, of Philadelphia, uses two Collin's specula opened anteroposteriorly and laterally, one fitting inside the other. He incloses the Crookes tube in a metal-lined box with a fenestra, so that the rays are concentrated on the vagina. By this plan protection of the external parts is unnecessary.

Another kind of box supported by twine is hung over the hypogastrium for cases of pelvic infiltration not reached by the vaginal application. Pennington [1] has designed special tube shields and specula of metal to inclose the Crookes tube and to insert in the vagina or rectum, which should often be a great convenience.

The Finsen actinic or ultra-violet ray has such a feeble power of penetration that it will probably prove of subordinate value in the treatment of cervical cancer. The author has no personal experience with it The high-frequency current emitting the violet ray in its sparks and possessing other therapeutic powers of its own is likely to prove more valuable.

Hydatidiform sarcoma of the cervical endometrium is a name given to a peculiar and rare growth of the cervical mucous membrane, first described by Weber [2] in 1867 From a broad pedicle a tumor grows out into the cervical canal and soon protrudes from the os into the vagina. The portion projecting into the vagina assumes the form of a bunch of grapes, varying in size, yellow, brown, or bluish-black in color. In addition to the spindle, round, and giant cells of sarcoma, the tumor may contain striped muscle-fibers and hyaline cartilage. It is not yet known from what part of the endometrium the growth originally springs. The peculiar grape-like form of the tumor in the vagina is due to obstructed circulation and a very rich blood-supply, the vesicles containing serum, jelly-like mucus, or myxomatoid material and blood This form of sarcoma occurs at any time from infancy to old age. It has most frequently been observed in the very young or the middle aged.

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[1] "Phila. Med. Jour.," Dec. 13, 1902.

[2] "Virchow's Archiv," Bd. xxxix, p. 216

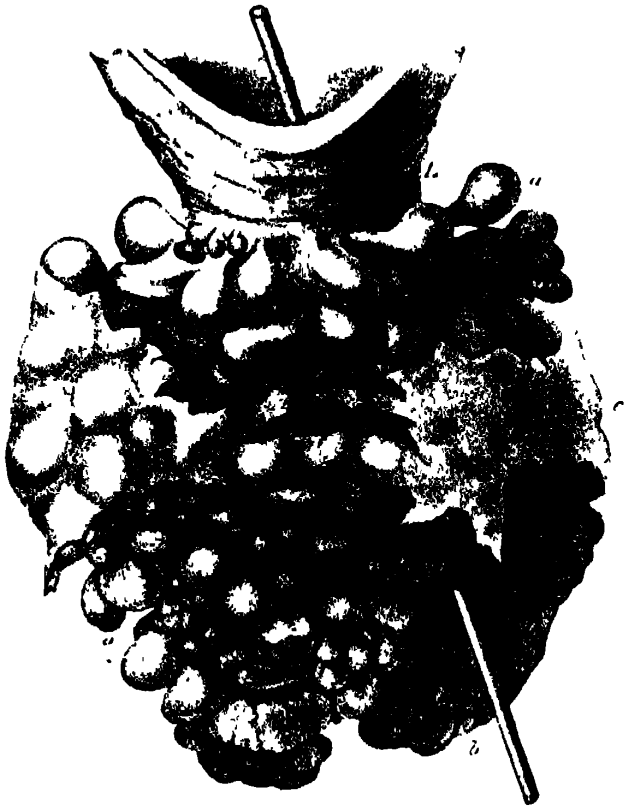


Fig. 282.—Hydatidiform sarcoma of the cervix: *L*, Dotted line showing the incision of the operation; *a*, isolated grape-like excrescence; *b*, numbers of single "berries" grown together; *c*, delicate membrane, epithelial in structure, stretched in part over the growth (Pernice).

The symptoms are leukorrhea, metrorrhagia, a foul discharge, dysuria from pressure on the bladder, dyspareunia from the obstruction of the vagina and possibly the protrusion of the tumor from the vulva.

The treatment is hysterectomy.

The prognosis, judging from the reported cases, is not good. They have all died. Possibly an earlier diagnosis would have saved them, but the symptoms are not sufficiently troublesome at first to compel a patient to seek medical advice, and the appearance of the growth at first would probably be so much like a mucous polyp that the differential diagnosis might be difficult. The recurrence of a growth regarded as a mucous polyp should arouse suspicion of sarcoma, and every polypoid tumor removed from the cervix should be examined microscopically.

PART VI.

DISPLACEMENTS AND DISEASES OF THE UTERUS.

THE uterus in its anatomical position is the central organ of the sexual system in women. It may be called the most important organ also in view of its chief function as the receptacle of the impregnated ovum and as the main source of the menstrual discharge.

Form and Divisions.—In shape the uterus is pyriform, flattened anteroposteriorly. It is divided into the cervix or neck, the corpus or body, and the fundus. It is necessary, moreover, to consider separately the *perimetrium*, or the peritoneal investment; the *parametrium*, or connective tissue surrounding the supravaginal portion of the cervix and the lower uterine segment; the *myometrium*, or muscular body of the organ, and the *endometrium*, or the mucous lining of the uterine cavity.

The cervix uteri has been described. The corpus uteri extends from the isthmus or the internal os to the level of the tubal insertions; it occupies about two-thirds the length of the uterus. The fundus uteri projects above the insertion of the tubes. It is domes-haped. Within the body of the uterus is its cavity. In longitudinal transverse section the cavity is triangular in shape, with the base of the figure above and the apex below. The lateral and superior borders of this figure curve inward toward the cavity in a nulliparous woman.

The perimetrium invests the fundus uteri, the anterior and posterior surfaces of the corpus, and by lateral extensions forms the broad ligaments. The peritoneum is tightly adherent to the uterus except on the anterior and posterior surfaces of the lower uterine segment or isthmus uteri, and on the posterior surface of the cervix, where it is separated from the myometrium by cellular tissue that admits of a peritoneal flap being stripped or dissected off. The dividing line between the tightly adherent and the separable perimetrium is not sharply defined, but one zone gradually passes into the other. On the anterior surface the loose attachment extends higher than on the posterior.

The perimetrium passes anteriorly into the reduplication of peritoneum forming the vesico-uterine pouch and posteriorly into the reduplication forming the recto-uterine or Douglas's pouch.

The parametrium is the connective and elastic tissue in the bases of the broad ligaments and under the anterior and posterior reduplications of the peritoneum. It is that portion of the pelvic connective tissue surrounding the cervix and lower uterine segment.

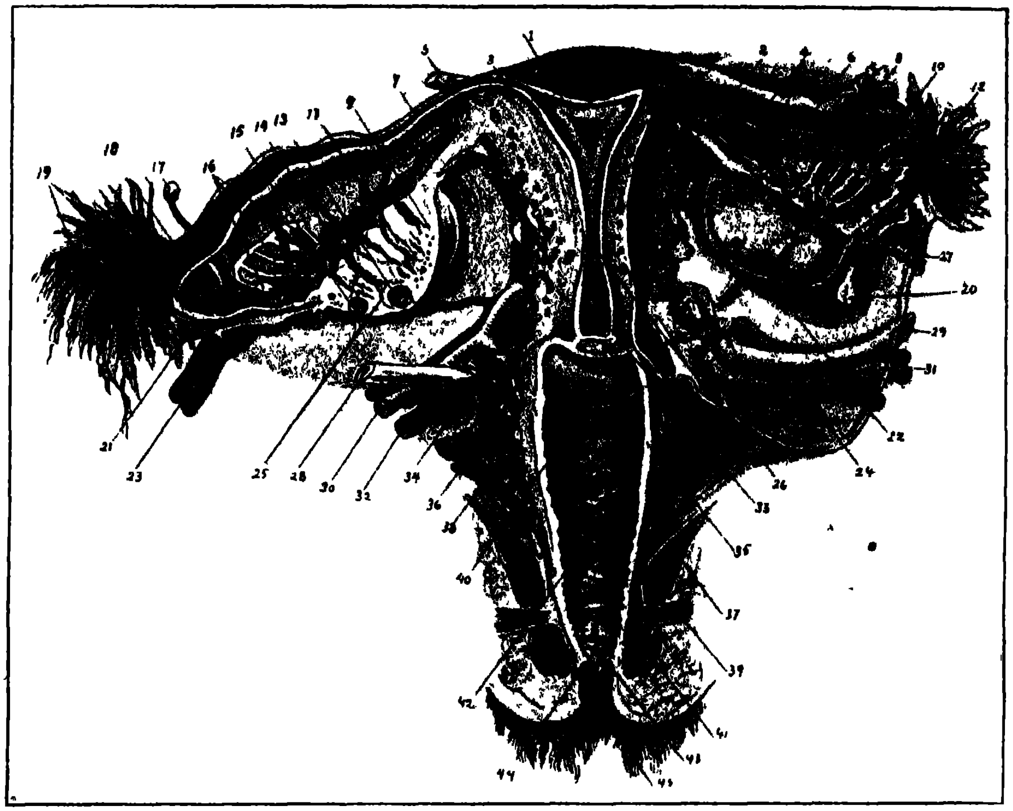


Fig 283 —Median transverse section of uterus and vagina, posterior view ; left tube and ovary in section ; posterior layer of left broad ligament removed : 1, Uterine cavity , 2, ovarian ligament ; 3, intramural portion of left tube ; 4, right tube and tubal branch of uterine artery , 5, round ligament ; 6, Farre's line on the ovary , 7, tubal isthmus , 8, accessory ostium of tube ; 9, parenchymatous zone of ovary , 10, epoophoron (parovarium) ; 11, vascular zone of ovary ; 12, infundibulum and abdominal ostium of tube ; 13, Graafian follicle ; 14, bulbus ovarii and pampiniform plexus ; 15, corpus luteum ; 16, cyst of epoophoron (parovarium), epoophoron and its duct ; 17, hydatid of Morgagni (vesicular appendix) , 18, abdominal ostium of tube ; 19, fimbriæ of tube ; 20, a bilocular vesicular appendix ; 21, ovarian fimbria ; 22, broad ligament ; 23, ovarian artery with its veins , 24, vesicovaginal vessels ; 25, section of left ovary ; 26, internal os uteri ; 27, ovarian artery and veins ; 28, left ureter , 29, right ureter , 30, uterine artery ; 31, uterine blood-vessels ; 32, uterine vein ; 33, cervical canal ; 34, cervicovaginal branch of uterine artery ; 35, vaginal wall ; 36, vesicovaginal plexus ; 37, levator ani muscle , 38, vesicovaginal artery and vein ; 39, muscle of the urogenital trigonum ; 40, external os uteri , 41, bulbus vestibuli ; 42, anterior vaginal wall ; 43, external urinary meatus , 44, anterior extremity of labium minus ; 45, interlabial space (Waldeyer).

The myometrium is unstriped muscular tissue arranged in three layers : a thick median layer, the fibers having a direction mainly circular; and an outer and inner layer of fibers, mainly longitudinal in direction. The muscular tissue of the uterus is continuous with that of the tubes, the vagina, the broad, round, uterosacral, and ovarian ligaments.

The endometrium is 1 to 2 millimeters thick. There is no submucosa; the mucous membrane is in direct contact with the myometrium. The membrane is smooth; there are no folds or projections. There are numerous tubular glands, mostly with a single canal, sometimes branched, running a spiral course and opening upon the surface of the membrane in funnel-shaped orifices visible to the naked eye The mucosa proper or interglandular structure consists of a network of fine connective-tissue fibers with flat, star- and spindle-shaped cells at their points of junction, and in their meshes round-cells of moderate size. The secretion of the uterine glands is scanty, affording normally nothing more than a moisture in the uterine cavity.

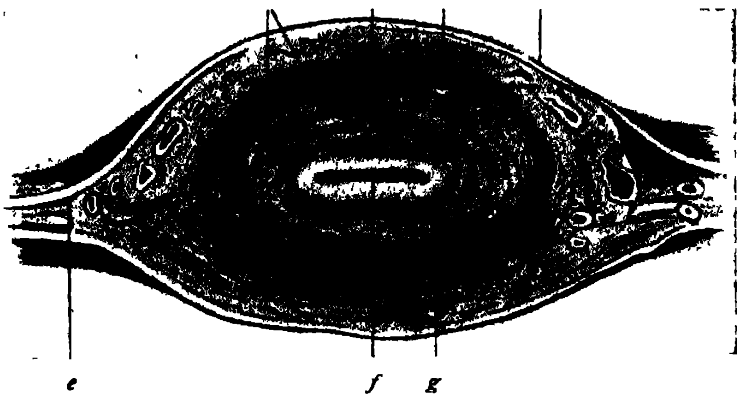


Fig 284.—Transverse section of corpus uteri: *a*, Myometrium; *b*, vascular layer of the myometrium; *c*, supravascular layer of myometrium; *d*, serous coat; *e*, beginning of the broad ligament; *f*, uterine cavity; *g*, endometrium (Waldeyer).

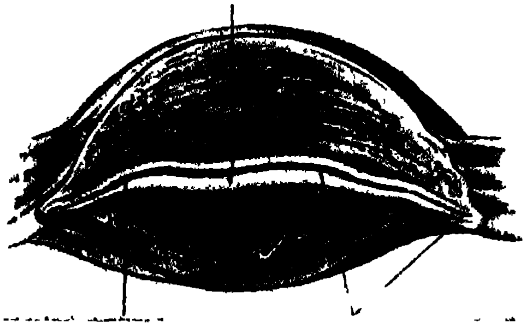
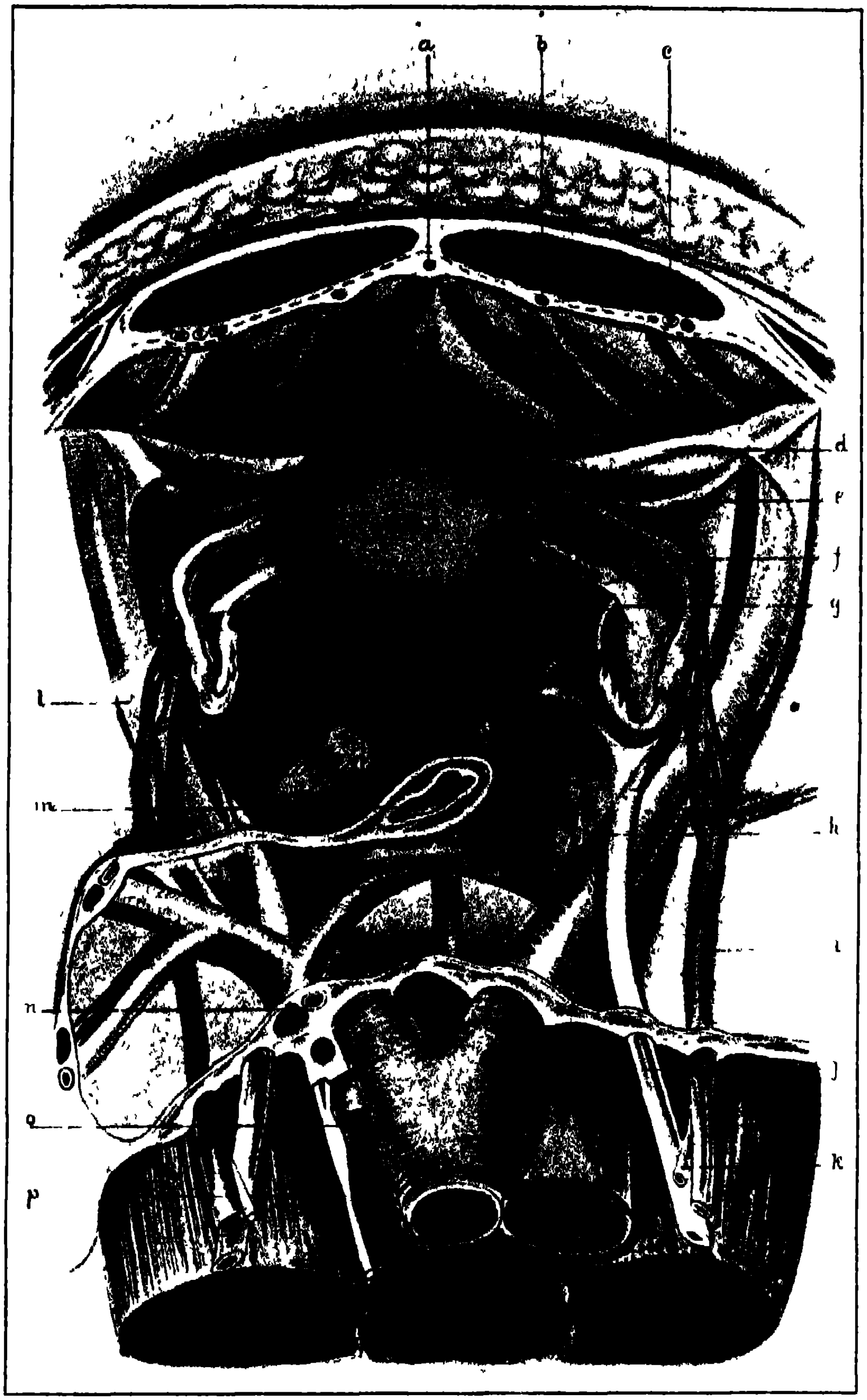


Fig. 285.—Transverse section of fundus uteri: *a*, Uterine cavity; *b*, uterine ostium of tube; *c*, uterine portion of tube (Waldeyer).

PLATE 10.



Uterus and appendages of a virgin, sixteen years old, seen from above. *a*, Median umbilical ligament; *b*, lateral umbilical ligament; *c*, inferior epigastric vessels; *d*, transverse vesical fold; *e*, round ligament of uterus; *f*, tubal isthmus, pampiniform plexus, ovarian ligament; *g*, uterine pole of the ovary; *h*, origin of internal iliac artery; *i*, ovarian vein; *j*, ureter; *k*, right ovarian artery; *l*, suspensory ligament of the ovary (infundibulopelvic ligament); *m*, colon; *n* inferior mesenteric vessels and lymph glands; *o*, vessels of fourth lumbar vertebra, sympathetic nerve trunk and ganglion (Waldeyer).

The epithelium of the endometrium is cylindrical and ciliated. The cilia lash toward the os uteri. The nuclei of the cells are usually in their middle. The protoplasm stains well.

The blood-vessels of the uterus are the ovarian and uterine arteries with their accompanying veins. The latter is the main and almost the sole source of arterial blood to the uterus, but the former must be taken into account because of its wide anastomosis with the ovarian branch of the uterine artery. The artery of the round ligament, a branch of the epigastric, is an insignificant vessel anastomosing with the uterine artery.

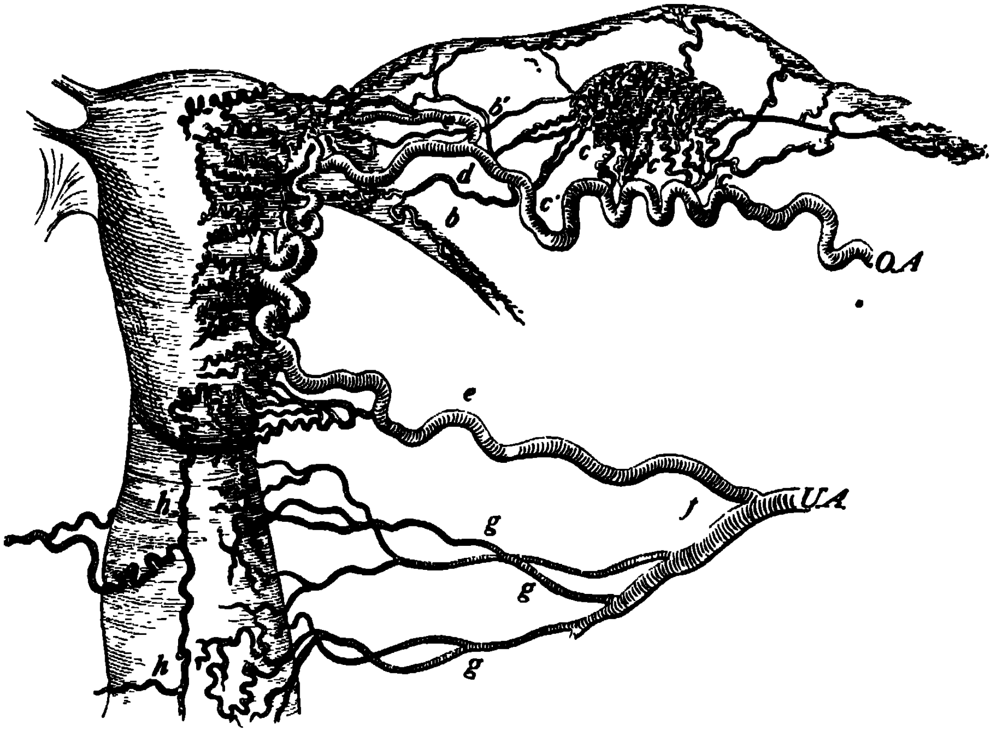


Fig 286 —The arteries of the uterus and ovaries · *O.A*, Ovarian artery; *b*, artery of the round ligament; *b′*, branch to the tube; *c*, *c*, *c*, branches to the ovary; *d*, continuation of main trunk; *e*, branch to the cornu, *U.A.*, uterine artery; *e*, main trunk; *f*, bifurcation; *g*, vaginal branches; *h*, vaginal branch from the cervical artery (Hyrtl)

The uterine artery arises from the anterior main branch of the internal iliac artery, runs downward along the outer side of the ureter, and then inward, crossing in front of the latter in the base of the broad ligament, at the level of the supravaginal portion of the cervix and about 2 centimeters from the lateral border of the uterus. At this point the main branch of the uterine artery is given off—the cervicovaginal artery. The course of the artery is then inward to the supravaginal portion of the cervix, upward by a turn at right angles to its former course along the lateral border of the uterus, to which numerous small branches are given off until it reaches the level of the ovarian ligament, where it gives off the tubal branch, branches to the fundus uteri, and the main branch, the ovarian, which becomes continuous with the ovarian artery. In nulliparous women the uterine artery runs a comparatively straight course along the lateral border of the uterus and almost a centimeter removed from it. In women who have borne children the course is much more tortuous and the artery lies so close to the myometrium as to be separated from it with difficulty.

The ovarian artery arises from the aorta, runs downward and inward in the upper portion of the broad ligament, anastomosing with the ovarian branch of the uterine artery. The two are practically continuous. It is impossible to say where one leaves off and the other begins. The veins of the uterus are thin-walled sinuses in the myometrium, emptying into the venous plexuses on the lateral borders of the uterus. Thence the venous blood flows downward to mingle with that of the uterovaginal plexuses At the level of the internal os the blood from these plexuses is carried off by two uterine veins accompanying the uterine artery and emptying into the internal iliac vein.

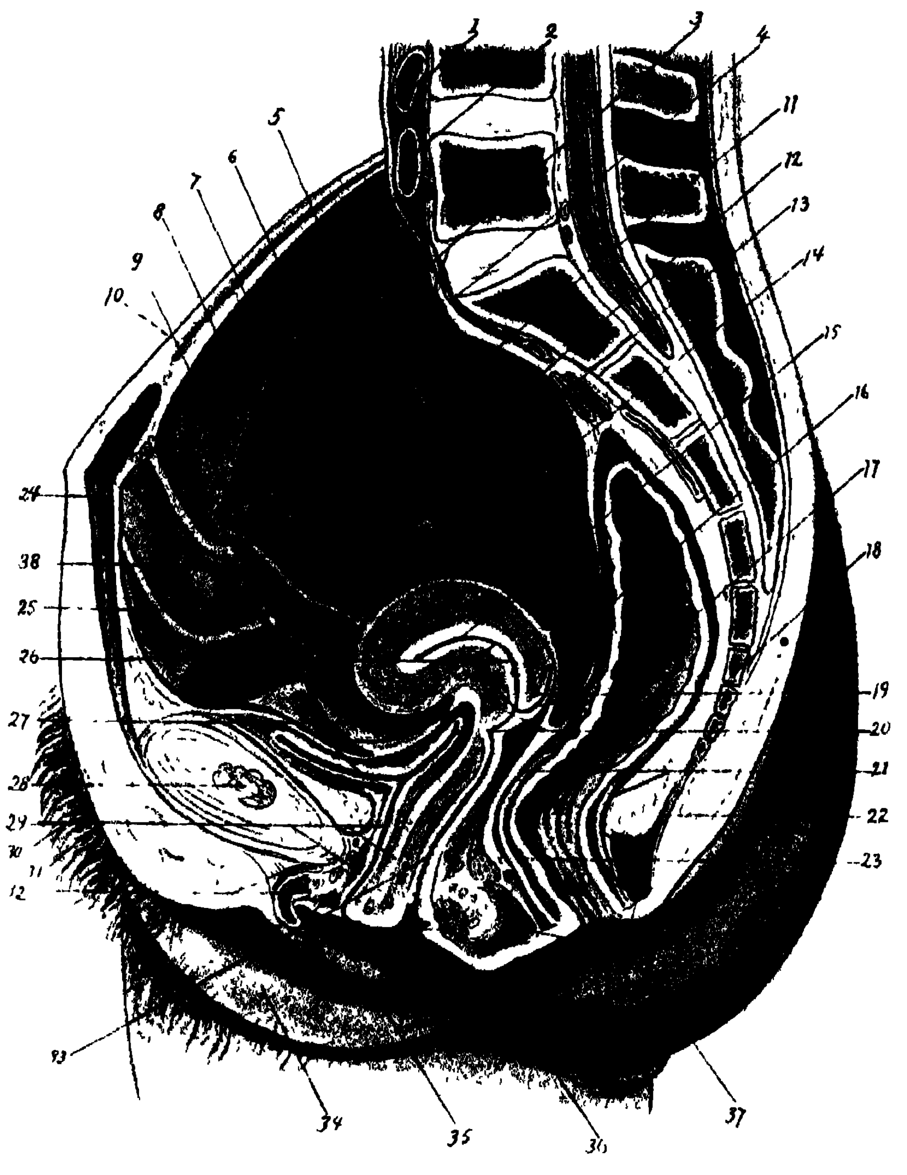
The lymphatics of the uterus have their origin in three sources—the endometrium, the myometrium, and the perimetrium. Two or three ducts run from the lateral border of the uterus to the hypogastric or iliac glands into which the lymphatic ducts of the cervix empty and which have already been noticed Other ducts from the fundus and the cornua of the uterus accompany the ovarian artery to the lumbar glands in front of the aorta at the level of the lower end of the kidney. A few small branches accompany the round ligaments and terminate in the inguinal glands.

The Nerves of the Uterus—Cerebrospinal branches from the second, third, and fourth sacral nerves supply the uterus from the central nervous system. The greater and more important nerve-supply is derived from the sympathetic system

From the interiliac plexus large branches run along the rectum and the uterosacral ligaments to the cervical ganglion, situated behind the point where the uterine artery crosses the ureter. Other branches are derived from the hypogastric plexus and from two ganglions situated at the entrance of the ureter into the bladder and between the former and the cervix.

The Ligaments and Supports of the Uterus.—The uterus is slung between the broad ligaments laterally, the round ligaments anteriorly, and the uterosacral ligaments posteriorly. It is

PLATE 11.



Median section through the pelvis of a multipara; the peritoneum is represented by a black line. 1, Left common iliac vein; 2, right common iliac artery, 3, right common iliac artery and vein, 4, promontory, 5, obturator nerve, 6, suspensory ligament of ovary, 7, Fallopian tube, 8, umbilical artery, 9, right external iliac vein; 10, right external iliac artery, 11, right ureter, 12, right hypogastric artery and vein, 13, uterine artery, 14, ovary, 15, uterine cavity, 16, Douglas's pouch, 17, rectum; 18, first coccygeal vertebra, 19, vaginal vault and posterior lip of cervix, 20, vaginal vault and anterior lip of cervix, 21, longitudinal muscular coat, 22, anococcygeal ligament; 23, circular muscular coat, 24, rectus muscle of abdomen, 25, superior vesical artery; 26, cervical canal, 27, vesico-uterine pouch and bladder, 28, cavity of the symphysis; 29, urethra, 30, urethrovaginal septum; 31, urogenital trigonum muscle; 32, clitoris and dorsal vein of the clitoris; 33, vagina and bulbocavernosus muscle, 34, labium majus, 35, labium minus, 36, perineum, 37, perineal portion of the rectum and external sphincter muscle; 38, round ligament of uterus (Waldeyer).

further supported by the posterior wall of the vagina, and by the parametrium, especially by the well-developed elastic, connective tissue and muscle-fibers accompanying the uterine arteries, which, by their specialized development, deserve the name of ligaments. They are called the transverse or cardinal ligaments of the cervix. In the erect posture the bladder affords the uterus considerable support in a moderately distended condition, and the intra-abdominal pressure with the weight of the abdominal contents upon the posterior uterine wall is a most important factor in maintaining a normal position of the uterus

The Mobility and Position of the Uterus.—The corpus uteri is much more mobile than the cervix; it moves up and down with every breath the woman draws. It changes its position with her posture: descending in the erect, ascending in the supine posture The fundus is elevated by a distended bladder, depressed by exerting the abdominal muscles to increase intra-abdominal pressure, as in defecation. It is possible to elevate the fundus half-way to the navel by firm pressure through the anterior vaginal vault or to drag the cervix down to the vulvar orifice by forceps. The fundus may be pushed to one or to the other lateral pelvic wall. The normal mobility of the uterus is therefore great and its possible mobility greater still. It follows that the normal position of the uterus may vary greatly and that there is no such thing as one invariable position There is, however, a typical position of the uterus, a wide departure from which constitutes a pathological malposition or displacement.

The typical position of the uterus may be thus described: In the erect posture it occupies the middle of the pelvic cavity between the planes of the outlet and inlet; the external os is at the level of the upper edge of the symphysis and the first or second coccygeal vertebra; it lies in the perpendicular plane of the spine of the ischia and therefore nearer the sacrum than the symphysis. The axis of the cervix corresponds with the axis of the pelvic canal, and the body of the uterus is bent upon the cervix at the isthmus at an angle of 70 to 100 degrees. A perpendicular line dropped from the fundus uteri would pass through the middle of the urethrovaginal septum; one from the internal os, through the rectum behind its middle; one from the external os, through the posterior quarter of the rectum. A horizontal line drawn from the fundus uteri passes through the fourth sacral vertebra; one from the lowest portion of the uterus, the lower end of the anterior lip of the cervix, passes through the last coccygeal vertebra

The typical position of the uterus in the erect posture is therefore one of anteversion and moderate anteflexion.

DISPLACEMENTS OF THE UTERUS.

The uterus may be turned on its transverse axis so that the intra-abdominal pressure is exerted on its anterior instead of on its posterior wall—*retroversion.* As the fundus and corpus are much more mobile than the cervix, the uterus turned over backward is almost invariably bent upon itself—*retroflexion.* There may be an exaggeration of the normal *anteversion* and *anteflexion.* The uterus may be tilted or bent to one side—*lateroversion, lateroflexion.* It may descend along the vagina and even emerge from the vulva—*prolapse of the uterus.* The corpus may be twisted upon its pedicle, the cervix—*torsion of the uterus* The hollow uterine muscle may be partially or completely inverted—*inversion of the uterus.*

Retroflexion and Retroversion of the Uterus.—A backward displacement of the uterus by rotation on its transverse axis is, with one exception, the commonest disease of women, constituting almost a fifth of all gynecological cases [1] Retroversion exists when the uterus is turned on its transverse axis sufficiently for the weight of the abdominal contents and the intra-abdominal pressure to be sustained by the anterior uterine wall instead of by the posterior wall. As the fundus and corpus move backward the cervix moves forward, but the latter, being much less mobile, does not describe as great an arc of a circle as the former; hence there is always some degree of retroflexion with a retroversion These malpositions must be distinguished from a retroposition of the uterus, without rotation on its transverse axis, which occurs in the supine position if the uterine ligaments are much relaxed or overstretched, or which may be the result of a tumor anterior to the uterus, as a myoma, or an overdistended bladder. Retroposition of the uterus rarely occasions symptoms and does not as a rule demand treatment.

It has been customary to describe three degrees of retroversion, but there is no justification clinically or pathologically for the distinction. Once the anterior wall of the uterus feels the weight of the abdominal contents and must sustain the intra-abdominal pressure as part of the yielding floor of the abdominal cavity, the uterine body will shortly be pushed as far backward and downward as the vagina and Douglas's pouch permit, unless the uterus is maintained in a certain position by peritoneal adhesions.

The Causes of Retroversion.—By far the commonest cause of retroversion is the increased weight of the uterus and the decreased tonicity of its ligaments following childbirth. Im-proper management of the puerperium naturally increases the predisposition to displacement. If the woman is allowed too great freedom of movement in bed; if she sits up or stands too soon; if she is allowed to strain too hard in defecation; to lift her baby or make any physical effort in the early puerperium that much increases intra-abdominal pressure, the uterus is likely to turn over backward. It should always be remembered that involution of the uterus and its ligaments is not completed for six weeks after childbirth. The patient and often her physician are disposed to disregard all precautions at the end of the conventional lying-in period of four weeks. As a matter of fact, backward displacement occurs rather more commonly between the fourth and sixth weeks than during the time the woman of the well-to-do classes remains in her room. A sudden violent jolt or jar stands next in frequency to childbirth as a cause of retroversion. Basket ball is responsible in recent years for many cases in young women. Riding on a side saddle, especially if the woman rides hard and jumps, causes more displacements than any other form of exercise. Such an accident as a fall from a top of a coach, or downstairs, or from a carriage, has thrown the uterus over backward. Inflammation of the uterine appendages, their prolapse into Douglas's pouch by their increased weight, their fixation there by adhesions, frequently cause a backward displacement of the fundus, which is pulled upon by the tubes and the ovarian ligaments.

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[1] 17.74 per cent, according to the statistics of Winckel, Löhlein, and Sänger.

A long-continued habit of allowing the bladder to become overdistended unquestionably predisposes to retroversion. Young girls should be cautioned against this fault, which is often unconsciously acquired on account of the numerous situations in a woman's life making urination embarrassing or inconvenient for a long period of time.

Retroversion may be congenital as the result of arrested development. It is claimed that the posterior wall in such cases develops less rapidly than the anterior wall and acts upon the latter like the string of a bow, pulling it backward and bending it on itself. A considerable number of retroversions may be traced to the influence of the vagina upon the cervix. If, for example, the supports of the posterior vaginal wall are injured and a rectocele develops, the posterior lip of the cervix is pulled downward and forward, throwing the fundus and corpus backward. A laceration of the vaginal sulci, therefore, may be the primary cause of a retroversion of the uterus.

Again, if the vaginal portion of the cervix is unnaturally long, it must be deflected forward by the course of the vaginal canal, thus throwing the fundus backward. An elongation of the vaginal portion of the cervix, therefore, may be the cause of retroversion. Cicatricial contraction of the anterior vaginal wall following labor or extensive ulceration has a tendency to pull the anterior lip of the cervix forward and thus to throw the fundus over backward.

The Symptoms of Retroversion.—The typical subjective symptoms of retroversion are backache, aggravated by exertion or prolonged standing on the feet; a feeling of weight and bearing-down in the pelvis, menorrhagia, and leukorrhea.

The half turn or fold of the broad ligament on itself in retroversion obstructs the venous circulation and causes a passive congestion; hence, in addition to the menorrhagia and leukorrhea which indicate a congestion and in time a hypertrophy of the endometrium, there is engorgement of the myometrium, an increase in the weight and size of the womb, and eventually a chronic metritis. There is also an interference with the circulation of the hemorrhoidal veins, and as a result hemorrhoids develop. The pull upon the parametrium between uterus and bladder and the pressure of the cervix on the neck of the latter give rise to vesical irritability and frequent urination or dysuria

The pressure of the fundus on the rectum may cause an obstinate constipation, which is aggravated by the indisposition of the patient to strain at defecation on account of the bearing-down sensation caused by increased intra-abdominal pressure The prolapse of the ovaries accompanying retroversion congests them and may produce ovarian pains.

The pressure of the fundus, often tilted to one side, upon the sacrosciatic plexus may cause neuralgic pains running down the limb or numbness and even some loss of power in a lower extremity. Reflex pains, aches, and neuroses are common. There is usually a pain or ache on the top of the head, in the occipital region, or in the nape of the neck. The coccyx may be the seat of a reflex pain simulating true coccygodynia. Neurasthenia and hysteria to a profound degree may be the ultimate result of a long-neglected retroversion. High fever has been observed immediately after an acute retrodisplacement of the uterus.

Retroversion may be accidentally discovered in women who have not exhibited a single symptom of the displacement.

The diagnosis of retroversion is made by a bimanual examination. The hand upon the abdomen fails to find the fundus where it is usually situated behind the symphysis, and the finger in the vagina traces the uterine body running across the posterior vaginal vault toward the sacrum, while the abdominal hand makes pressure from above; the angle of flexion may also be felt above the posterior fornix of the vagina. The position and direction of the cervix, on which great stress is sometimes laid, are of little importance. In a typical retroversion the cervix points toward the symphysis instead of toward the sacrum; but in a sharp retroflexion it may not do so, and it may be directed toward the symphysis in an exaggerated anteflexion, especially if the anteflexed uterus is retroposed, as it sometimes is.

The Treatment of Retroversion.—It is necessary in practice to consider separately and to treat differently retroversion in the puerperium, acute retroversion from an accident or strain, and chronic retroversion which has probably existed a considerable time. It is necessary, also, to take into account the circumstances of the patient and her ability to undergo a prolonged treatment involving a life of comparative leisure or at least freedom from hard work.

The Treatment of Retroversion Originating in the Puerperium.—Every woman should be examined between the third and the fourth week after her delivery at term, or earlier after a miscarriage, when she begins to walk about her room. If a retroversion is discovered, the uterus should be replaced, and the patient should be instructed to assume the knee-chest posture for five minutes night and morning while undressed for bed; from the knee-chest position she should be shown how to gently sink on one side in the Sims' position, in which she should lie for ten or fifteen minutes before getting up As the vulva usually gapes shortly after confinement, no special precautions are necessary, as a rule, to insure the entrance of air into the vagina so that atmospheric pressure may assist gravity in the reposition of the womb. If there is any doubt on this point, a finger or the nozzle of a vaginal syringe should be inserted into the vaginal orifice after the assumption of the knee-chest posture. A pessary is contraindicated at this time on account of the weight of the uterus, the relaxation of its ligaments and of the vagina Many a case of retroversion in the puerperium is cured permanently by this simple postural treatment which, if neglected, would become unmanageable except by an operation or the indefinite use of a pessary.

Whether the uterus is retroverted or not at the first examination, a second examination should invariably be made at the end of six weeks, when involution is complete. If a retroversion is then discovered, the uterus should be replaced, a suitable pessary inserted, and the patient should be given an eight weeks' course of medical gymnastics and abdominal massage[1] to strengthen the pelvic muscles and ligaments, and to improve the pelvic circulation. At the end of eight weeks the pessary is removed The patient is examined two, four, and six weeks later. If the uterus is found at the last examination in good position, the patient may be dismissed as cured A large proportion, if not the majority, of cases thus treated are permanently cured. If the retroversion returns after the removal of the pessary, the patient should be told that the uterus will probably not remain in place without some form of artificial support, and she should be offered the choice of a continued, probably an indefinite, use of the pessary and a radical cure by an operation. The advantages and disadvantages of the two plans of treatment should be explained to her, and she should be allowed to make her own choice without being urged by the physician to one course or the other.

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[1] A system has been perfected in the institutes of Germany and Sweden which is very effective. The author puts his patients under the charge of a graduate of these institutions, who supervises the exercises and gives the massage.

The Treatment of an Acute Retroversion the Result of an Accident.—If a woman meets with an accident and suffers from pelvic pain and backache afterward, she should be examined If a retroversion is discovered, the uterus should be immediately replaced. Both the examination and reposition should be done under anesthesia if the patient is a young unmarried girl. If the uterus is replaced shortly after its acute displacement, it nearly always remains in good position without support A pessary, therefore, should not be inserted. The patient, however, should be instructed to take the knee-chest posture night and morning. A week or more after the reposition another examination should be made. If the uterus remains in good position, the displacement is probably permanently cured.

The Treatment of a Chronic Retroversion—If a backward displacement has existed for a considerable time, when the patient first comes under a physician's observation, the uterus should be replaced and a pessary should be inserted A course of medical gymnastics and massage should be recommended, with the knee-chest posture night and morning. At the end of eight weeks the pessary should be removed and an attempt made to go without it, the patient being instructed to take the knee-chest posture twice a day. An examination should be made at the end of one, two, and six weeks. If the uterus remains in good position at the last examination, she is probably cured, though the woman who has had a retroversion is likely to have it again if she bears children or is exposed to the other causes that are responsible for a backward displacement of the uterus. If the retroversion returns after the removal of the pessary, the uterus will probably always require some artificial support. This fact should be stated to the patient, who should be offered the choice of an indefinite use of a pessary or of the radical cure by operation.

The Reposition of a Retroverted Uterus.—The best and most convenient plan of replacing a retroverted uterus is the bimanual manœuver of Schultze. The patient's clothing is loosened; she is placed in the dorsal position with the thighs well flexed on the abdomen, the legs on the thighs, the pelvis slightly elevated, and

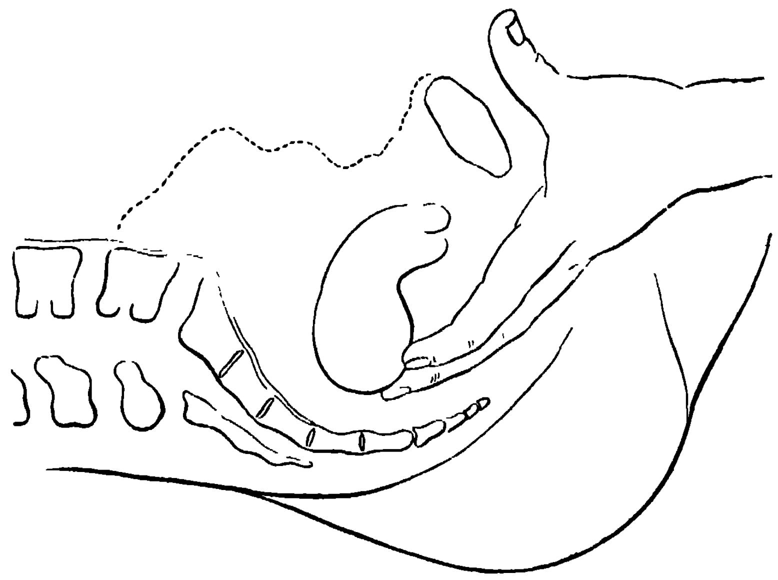

Fig 287.—Bimanual reposition of the uterus, first step

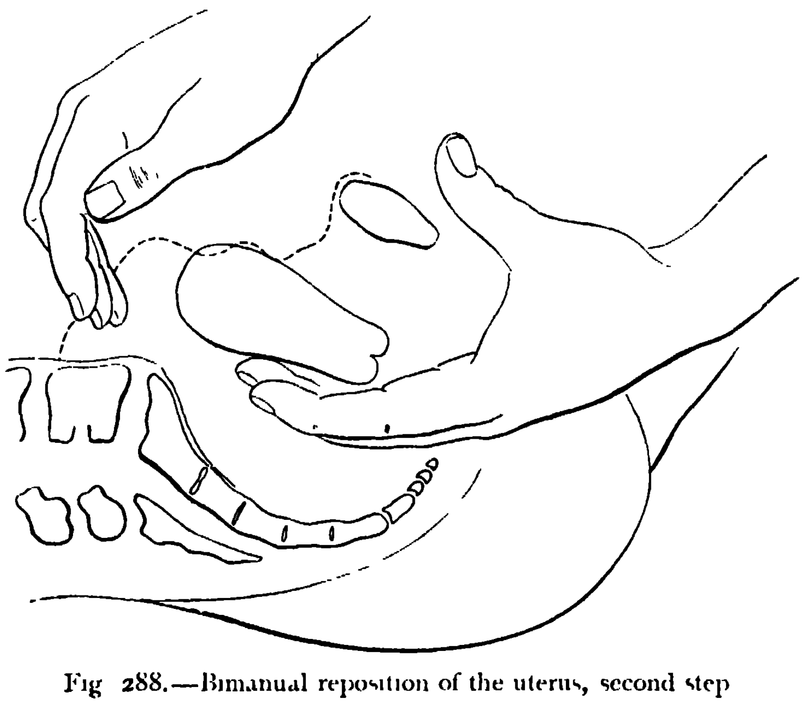

Fig 288.—Bimanual reposition of the uterus, second step

the trunk flexed just above the pelvis. Two fingers of the left hand are inserted in the vagina, elevating the retroverted uterus as high as possible by pressure through the posterior vaginal vault. The fingers of the other hand depress the abdominal wall until their tips are hooked under the fundus uteri, which is pulled forward while the internal fingers are quickly shifted from the posterior to the anterior vaginal vault, pressing the cervix and lower uterine segment back as the fundus is pulled forward.

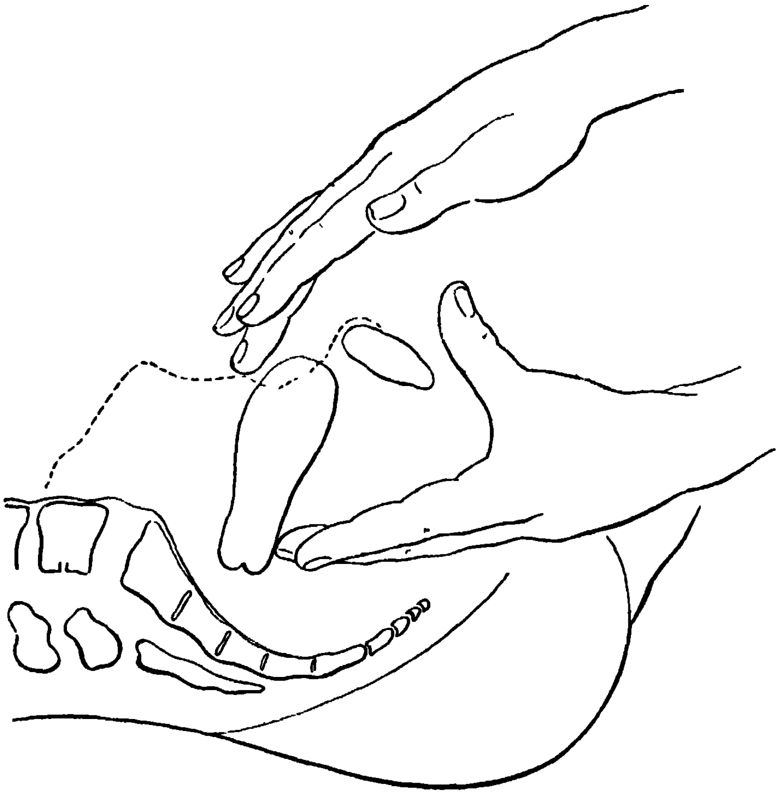

Fig. 289 —Bimanual reposition of the uterus, third step.

Finally, the physician, to assure himself that the position of the uterus is good, grasps the fundus and body between the internal fingers and the fingers on the abdominal wall. It is sometimes easier to replace the uterus by making the fundus describe a semicircle from the sacrum to the symphysis, making it rotate upon an anteroposterior axis instead of upon a transverse axis. To replace a retroverted uterus by bimanual manipulation, the vagina must be capacious, the abdominal walls perfectly relaxed and not too fat, and the woman herself not too sensitive. These conditions are not always present, and if they are not, the bimanual reposition may be impossible without an anesthetic. In such a case the patient is put in the knee-chest position, a Sims' speculum is inserted, and the posterior vaginal wall well retracted. The cervix is seized with a tenaculum, pulled downward and backward, while the fundus and corpus are pushed forward by pressure through the posterior vaginal vault exerted by means of a uterine repositor (Fig. 290) or a pledget of wool on the end of a forceps, the instrument being used as a lever with the fulcrum supplied by the blade of the speculum.

It is often possible to dispense with the tenaculum and to replace the uterus with the repositor alone.

At long intervals one fails to replace a retroverted uterus by both of these plans, although there are no adhesions and the uterus is perfectly mobile. In such cases it is justifiable to use the uterine sound as a repositor, if the strictest precautions are taken to avoid infection of the uterine cavity. This may be done by boiling a bivalve speculum, a dressing forceps, and the sound bent in a good curve; inserting the speculum and distending its blades widely, wiping off the cervix with cotton balls soaked in a 1 : 1000 sublimate solution, inserting the sound directly into the os without allowing it to touch anything but the inner surfaces of the speculum blades, passing it to the fundus, rotating the handle with a wide circular sweep so as to bring the concavity of the sound upward, removing the speculum and depressing the handle of the sound firmly, but not with sufficient force to penetrate the uterine muscle In women who are extremely obese and very nervous or apprehensive this will be found the easiest method for both patient and physician; but the use of a sound as a repositor should be restricted as much as possible, and the greater one's experience, the less will be his need for it This method, however, is a justifiable and an advantageous one on rare occasions.

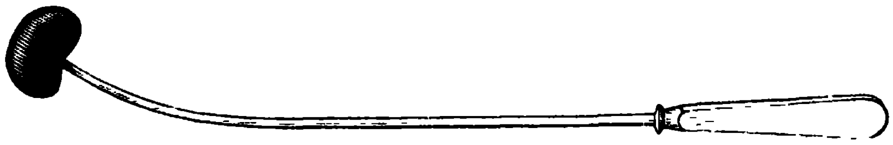

Fig 290 —Uterine repositor

The Treatment of Retroversion Complicated by Adhesions and Fixation of the Uterus.—Not infrequently all attempts to replace the uterus fail on account of adhesions binding the fundus to the rectum or uniting the uterus and its appendages to neighboring intrapelvic structures. Usually the adhesions can actually be felt when the uterus is elevated and the adhesive bands are put on a stretch; ordinarily the tubes and ovaries are displaced, fixed, enlarged, and infiltrated, and these conditions are plainly recognized in a bimanual examination. Occasionally, however, no adhesions can be demonstrated by one's sense of touch; yet they may be assumed to be present if none of the methods just described succeeds in replacing the uterus, or if, as soon as the womb is replaced, it immediately returns to its former position when released from the bimanual grasp of the examining physician.

If the diagnosis of pelvic adhesions is made the patient should be given the choice of two plans of treatment. an abdominal section with the necessary treatment of the diseased appendages, severing adhesions, and suspending the uterus, or a prolonged course of vaginal packing with tampons to gradually elevate the uterus, and the subsequent use of a pessary. It should be stated that the latter course is tedious, trying to the patient's nervous system, and uncertain in its results, but in many patients there is, after weeks of treatment, symptomatic relief, and in some the uterus remains in place supported by a pessary, in a small minority of cases there is a permanent cure without the necessity of artificial support of any kind By stating the facts and pointing out the relative advantages and disadvantages of the two plans of treatment, allowing the woman to make her own choice, the physician is beyond criticism, as he would not be if he urged one plan or the other on his patient

If the palliative treatment is decided upon, it should be carried out as follows: The patient is placed in a knee-chest position, a Sims' speculum is inserted and the posterior vaginal vault is well retracted, the fundus uteri is pressed as far forward as possible by the repositor without causing the patient too much pain, tampons of lamb's wool are packed firmly in the posterior vaginal vault with an Emmet curetment forceps held with the concavity of the curve in the instrument downward, when the posterior vault is filled to the utmost, other tampons are placed anterior to the cervix, and others still in the vaginal canal to support those above. Each tampon before its insertion is dusted with powdered boracic acid. The patient is instructed to remove the tampons by the string attached to them at the end of forty-eight hours, just before her next visit to the doctor's office, and to take a vaginal douche of boracic acid, ʒij to Oij. The tampons are renewed every other day, the treatment naturally being intermitted during menstruation. If the woman has patience to persist in this treatment for ten or twelve weeks, there is often an astonishing improvement in the physical signs of the former pelvic disease and a most gratifying relief of symptoms. Large, distended, adherent tubes may become practically normal in size and position, the uterus is freely movable, is easily supported by a pessary, and sometimes remains in perfect position without support. On the contrary, there are some patients who can not endure local treatment, who are not willing or able to spare the time for it, or who do not care to undertake it in view of the uncertainty of its results. Such patients will elect the operative treatment. Moreover, if the local treatment fails, as it may, and often does, the choice must eventually be made of enduring the symptoms of a fixed retroverted uterus or of being cured by an operation.

The Use of Pessaries in the Treatment of Retroversion.—There has been a reaction against the indiscriminate use of pessaries which has gone too far. No one can successfully manage a number of cases of retroversion, no one can retain a considerable proportion of his patients who has not mastered the art of supporting a uterus in this manner.

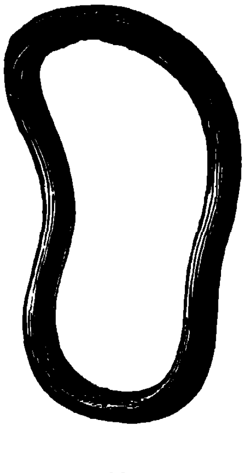
Fig. 291.—Hodge pessary for retroversion

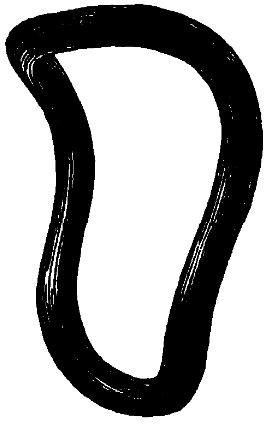
Fig. 292.—Smith pessary for retroversion

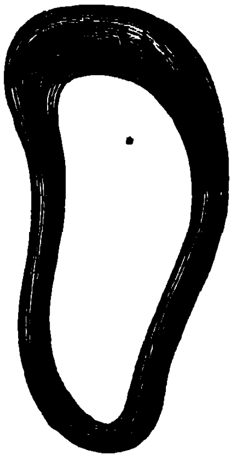
Fig. 293.—Thomas pessary for retroversion

A pessary[1] should be made of hard rubber, and for retroversion should have the shapes designed by Hodge, Albert Smith, and Thomas. Various sizes of these three pessaries should be at hand. The Smith pessary is on the whole the most suitable in the majority of cases. The narrow anterior bar and the bend in it to avoid pressure on the urethra are great advantages. The broad anterior bar of a Hodge pessary, however, and its lack of downward curve make it available in a relaxed vagina which could not support the Smith pessary The advantage of a Thomas pessary lies in its thick posterior bar, which distributes the pressure on the posterior vaginal vault, thus avoiding ulceration of the vaginal mucous membrane better than if the pressure were concentrated on the narrow bar of the other pessaries.

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[1] From πεσσός, an oval-shaped stone used in the ancient game of draughts.

It should be remembered that by oiling a hard-rubber pessary and heating it over a spirit-lamp it may be bent in any shape the physician desires to suit an individual case. By immersing it in cold water the shape given it is permanently retained. If a pessary is immersed in boiling water, as is sometimes mistakenly done to cleanse it, it reassumes the shape of a simple ring from which it was originally bent. The pessary acts as a lever in the vagina, with the long arm anteriorly receiving the weight of the intrapelvic and abdominal contents, the fulcrum being the posterior vaginal wall where the posterior curve of the pessary begins and the force of the short arm of the lever being exerted upon the uterosacral ligaments, pulling the cervix back and thus tilting the fundus forward. The pessary is held in the vagina by the shape of the canal, S-shaped in its curve and funnel-shaped from above downward, by the cervix over which the posterior bar is hooked, and also by the grasp of the elastic and muscular tissues in the vaginal wall. The funnel shape of the vaginal canal is contributed by the strong muscles that encircle it posteriorly, the levator ani and the bulbocavernosus muscles. If these muscles are injured or very much relaxed there is no fulcrum afforded the lever pessary, the posterior transverse bar is not

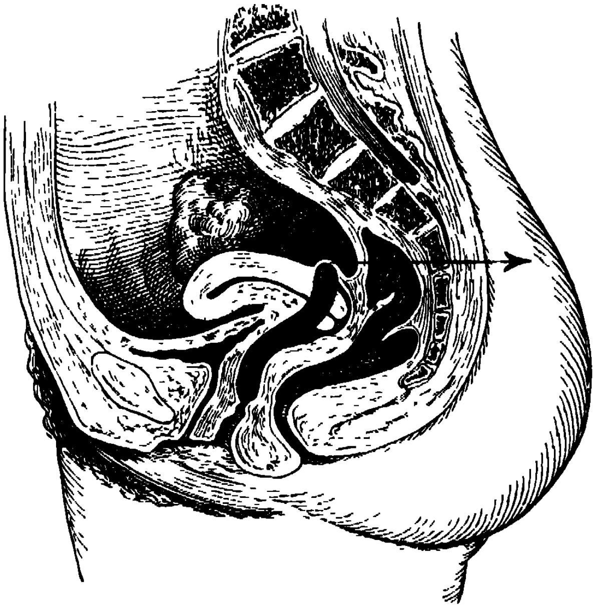

Fig 294.—The retroversion pessary in position. The arrow shows the direction of the traction of the posterior vaginal wall upon the cervix

pressed firmly into the posterior vaginal vault behind and above the cervix, the prolapsed posterior vaginal wall pulls the posterior bar downward and forward, and the vagina being no longer a funnel with the small end downward, the pessary is free to slip out. Hence an extensive injury of the pelvic floor in labor makes the use of a pessary impossible. A perineorrhaphy must be performed before it can be employed.

Other contraindications to the use of a pessary are fixation of the uterus in a posterior position, prolapsed and adherent ovaries.

The author is averse to the use of a pessary in young unmarried girls. The vagina is so narrow, especially in its entrance, that it is difficult to insert a pessary large enough to support the uterus, and the necessity for frequent examinations while the pessary is worn is most objectionable.

The insertion of a pessary should be conducted as follows: The uterus must first be replaced in perfect position. The pessary is not a repositor and will do more harm than good if the uterus is retroflexed over its posterior bar, as it surely will be unless the fundus is in perfect anterior position, before the pessary is inserted.

The patient is placed in the dorsal position. The pessary is cleansed with soap and water and its posterior bar is anointed with an unguent. The physician takes the anterior bar of the pessary between the thumb and forefinger of his right hand, holding it obliquely with the concavity of the posterior curve directed downward; with the forefinger of the left hand pressure is exerted in the right posterior vaginal sulcus. The pessary is then inserted in the elongated oblique diameter of the vagina, being turned on its long axis as it approaches the vaginal vault to bring the concavity of the posterior curvature upward. This movement brings the posterior bar in front of the cervix. The forefinger of the left hand is inserted in the vagina behind the pessary, is placed over the posterior bar, by turning the dorsal surface of the finger upward and passing the finger-tip through the ring of the pessary. The posterior bar is then pressed backward over the cervix until it slips behind it into the posterior vaginal vault. The pessary should be long enough to reach from the posterior vault of the vagina to about the middle of the urethra, and broad enough to stretch across the vagina with the lateral bars touching the lateral walls without pressing them firmly. It should be possible to pass the finger-tip easily anywhere between the pessary and the vaginal walls. While the woman wears a pessary she should be instructed to take a douche of boracic acid, ʒij to Oij, after each menstrual period, beginning twenty-four hours after the cessation of the flow, and repeating the douche daily for a couple of days. Another douche should be taken midway between the period. Daily douches are unnecessary. The patient must report to her physician every six or eight weeks. At these visits the pessary is removed and the position of the uterus is investigated. The posterior vaginal vault is carefully inspected through a bivalve speculum, and if the mucous membrane is healthy, the pessary is cleansed with soap and water, anointed with an unguent, and reintroduced. Every woman whose uterus is maintained in position by a pessary for a long time will exhibit some redness of the posterior vaginal vault where it is rubbed by the posterior bar of the pessary, and occasionally, perhaps only once in two or three years, there will be an actual superficial ulceration. If ulceration is threatened or has actually occurred, the pessary must be left out for two weeks, the patient taking a daily boracic acid douche. The uterus may thus be maintained in good position indefinitely, the woman being perfectly comfortable. The author has under his care cases of fifteen years' duration in which a pessary has been worn constantly. If the patient elects this treatment after a full knowledge of the facts and of the possibility of a permanent cure by

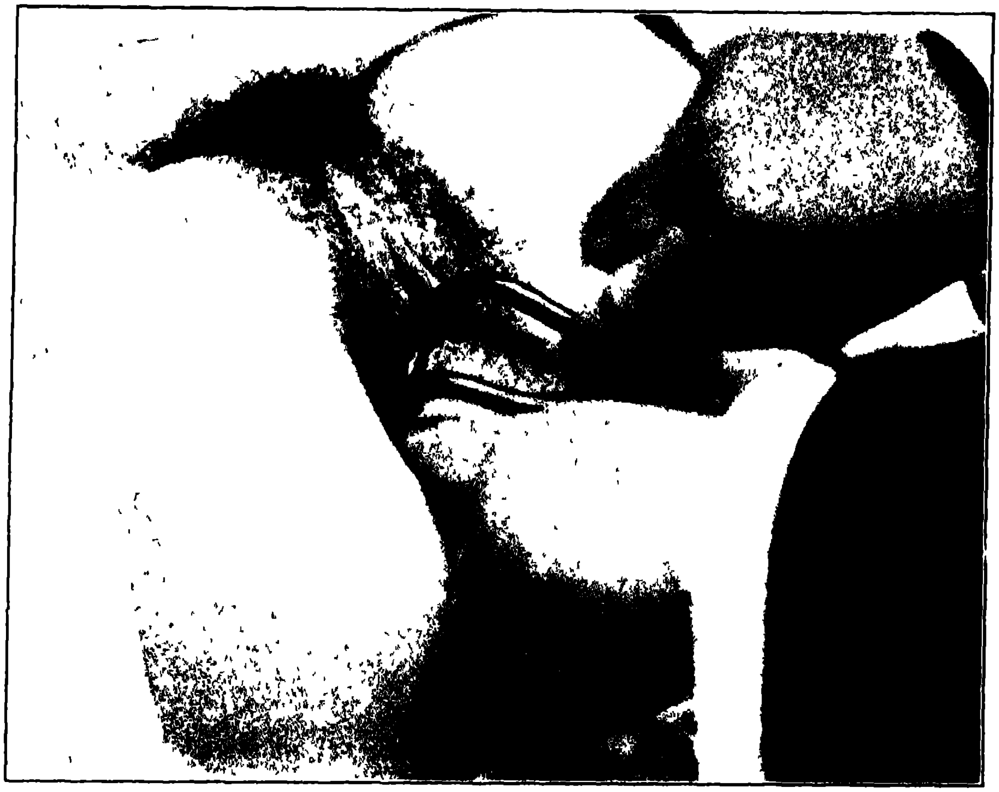

Fig. 295.—Insertion of a pessary.

operative treatment, she has, of course, a perfect right to choose her own course, and indeed will do so, going to another physician if the original attendant has not the ability and skill to manage her case as she is determined it shall be managed

The Operative Treatment of Retroversion.—Various plans of correcting a retroversion by surgical means have been proposed: fixing the fundus to the peritoneum of the vesico-uterine pouch (Schucking, Dührssen, Mackenrodt); shortening the uterosacral ligaments; an intrapelvic shortening of the round ligaments by folding them on themselves (Wylie, Mann, Dudley); shortening the round ligaments by pulling them out of the inguinal canals (Alquié, Alexander, Adams); and suspending the fundus uteri from the anterior abdominal wall (Olshausen, Lawson Tait) Of these methods, the last two alone are to be recommended. The various plans of vaginal fixation must be condemned on account of dangerous complications in subsequent pregnancies and labors. No other operative procedures have given such bad results in childbirth Moreover, the proportion of recurrences after vaginal fixation is the largest yielded by any of the operations for retroversion. Intrapelvic shortening of the round ligaments cannot be recommended because of the weak fixed point in the anterior end of the round ligament upon which the success of the operation depends. The author's objection to these operations is not merely theoretical, but is based upon practical trials

The intraperitoneal shortening of the round ligaments by abdominal or vaginal section has exercised the ingenuity of many operators Wylie folds them once on themselves and sews the folds together, Dudley sews the folds together and fastens them to the anterior uterine wall, Mann folds them twice on themselves by means of a special forceps and sews the three folds together Other procedures are: to dissect the ligaments out of the peritoneum, to fold and sew the folds together, and to bury the ligaments again under the peritoneum, to cut them loose at the internal inguinal ring after ligation, to dissect them out and to use the ligaments as a thick suture which is fastened in the abdominal wound or is carried through the rectus muscle and the fascia and fastened above the latter, to carry a fold of the ligament through the broad ligament back of the uterus and to unite it with its fellow of the opposite side

Shortening of the uterosacral ligaments is a difficult procedure, the utility of which has not yet been demonstrated. Of the two operations recommended, shortening the round ligaments in the inguinal canal is the superior for the following reasons: It is perfectly safe; there are no recorded cases of difficulty in subsequent labors; the proportion of recurrences is the least of any of the operations for retroversion; there is no disturbance whatever of the normal anatomical relations of the uterus. The danger of hernia can be avoided by proper suturing.

No one can perform the two operations side by side over a period of years and in a large number of cases without admitting the superiority of the modern Alexander operation as modified by Edebohls. It is unfortunate, therefore, that the operation has a somewhat limited field. There should be no intrapelvic disease; no pelvic adhesions; the woman should not be too old nor too fat;

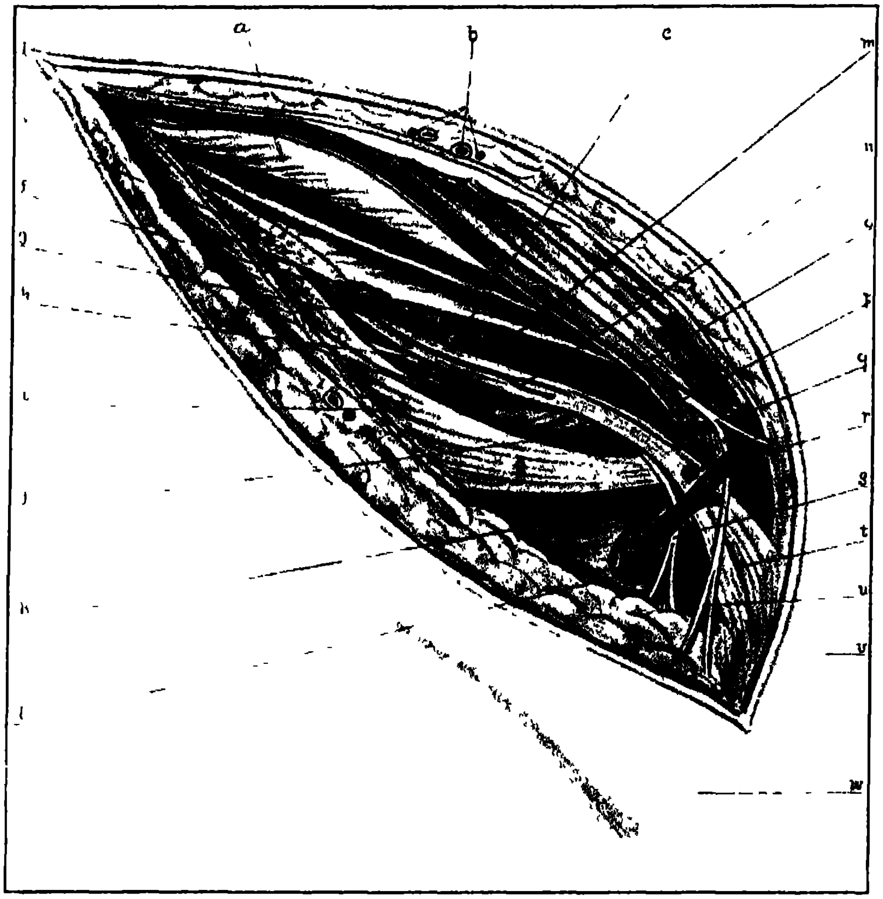

Fig. 296.—Anatomy of the inguinal canal: *a*, Aponeurosis of the external oblique; *b*, superficial epigastric vessels; , epigastric vessels; *d*, ilio-inguinal nerve; *e*, sections of transversalis and internal oblique muscles; *f*, vaginal process of peritoneum; *g*, fold of the transverse semilunar fascia; *h*, genitocrural or spermatic nerve; *i*, aponeurosis of external oblique muscle; *j*, inguinal ligament; *k*, superficial femoral fascia; *l*, external pudic vein, *m*, transversalis fascia; *n*, round ligament and its artery; *o*, fibers of insertion of the round ligament; *p*, upper column of the ring; *q*, branch of the external pudic vein; *r*, position of the pubic spine; genital branch of genitocrural or external spermatic nerve, *t*, round ligament; *u*, ilio-inguinal nerve; *v*, mons veneris; *w*, labium majus (Waldeyer).

the uterus should not be too large or heavy, and there should not be a decided prolapsus.

Shortening the Round Ligaments; Alexander's Operation.—The groins, the thighs a third of the way down should be prepared as for an abdominal section (page 600). The field of operation being displayed, the skin along the course of the inguinal canal is wiped off vigorously with alcohol poured on a sterile gauze pad.

The operator places his forefinger on the pubic spine, his thumb on Poupart's ligament, about an inch and a half intervening between the two. The points of the forefinger and of the thumb are then moved upward about a quarter of an inch and an incision through the skin is made between them. The fat and superficial fascia are divided to the deep fascia. Several blood-vessels are severed, the bleeding ends of which must be seized by hemostats. All the bleeding must be controlled before the deep fascia is opened, otherwise the difficulty of finding the round ligaments is much increased. The fascia is incised just above Poupart's ligament, the incision running through the pillars of the external inguinal ring. On the position of the incision depends the ease with which the round ligaments are found. If it is too high, they may not be located at all, or only with such difficulty and delay that the operation is scarcely justifiable. The inguinal canal being laid open by the division of the fascia, the edges of the wound are retracted with forked retractors. The round ligament is at once seen as a whitish or pinkish cord about as large as a slate-pencil, running along the floor of the canal. It is picked up by a blunt hook and gently drawn out of the internal ring, the genitocrural nerve which accompanies it being avoided. The peritoneal investiture which soon appears is stripped back by a gauze

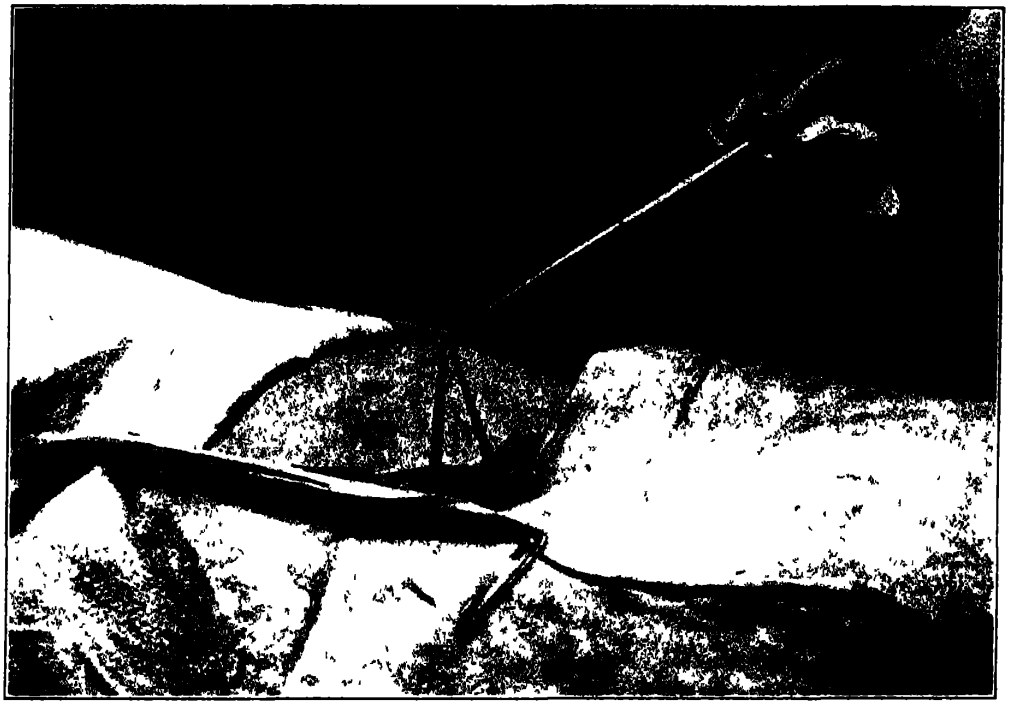

Fig. 297.—Round ligament, freed, but not yet detached.

pad and the ligament is pulled out until it is freed for at least four inches. It becomes thicker and stronger as it emerges from the internal ring, until it may reach almost half the caliber of one's little finger. One ligament being extracted, the wound is covered with a gauze pad and the other groin, opposite the operator, is opened in the same way, except that if the operator stands on the patient's right hand, the thumb of his left hand marks the position of the pubic spine and the forefinger is placed upon Poupart's ligament about one and a half inches away.

Both ligaments being freed as far as possible (at least four inches, oftener more), they are pulled upon by an assistant, while the operator lays his outspread hand upon the hypogastrium, against which he feels the fundus uteri bump as the ligaments are pulled upon. The terminal ends of the ligaments are cut off, they are crossed in the middle line over the mons veneris, and a hemostat fastens them both where they cross to insure an equal amount of traction on each when they are sewed fast in the inguinal canal.

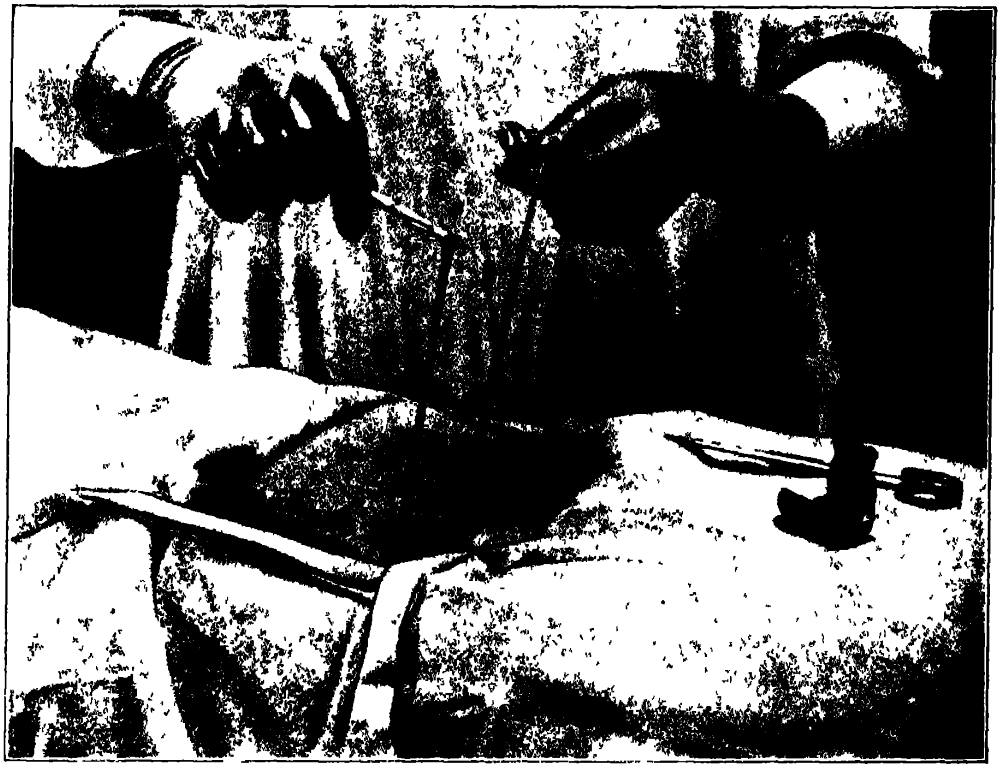

Fig 298.—Round ligaments pulled out of inguinal canal four to six inches.

The sutures are now inserted. A strand of formalin catgut (size No. 3) on a curved needle is passed through the fascia at the upper angle of the wound, the end remaining loose, not knotted; the needle then passes through the internal oblique muscle, goes through the center of the round ligament, picks up the floor of the inguinal canal, and finally passes through Poupart's ligament. Four or five turns are thus taken, in the same order, each one passing through the center of the round ligament until the external pillars of the ring are united. The next turn of the needle passes under the round ligament, obliterating the external ring from above downward. All the redundant portion of the round ligament is cut off, the same needle and thread are then passed through the fascia alone midway between the turns of the continuous suture already in place, until the suture ends opposite the point where it began and is knotted in a triple knot, the only one required. The superficial fascia and fat are joined by a continuous fine formalin catgut suture in two tiers. The skin is united by a continuous suture of catgut or an intracutaneous stitch as the operator prefers. The groin wound nearest the operator being closed, the other one is treated in the same way, except that a right-handed man naturally passes the needle

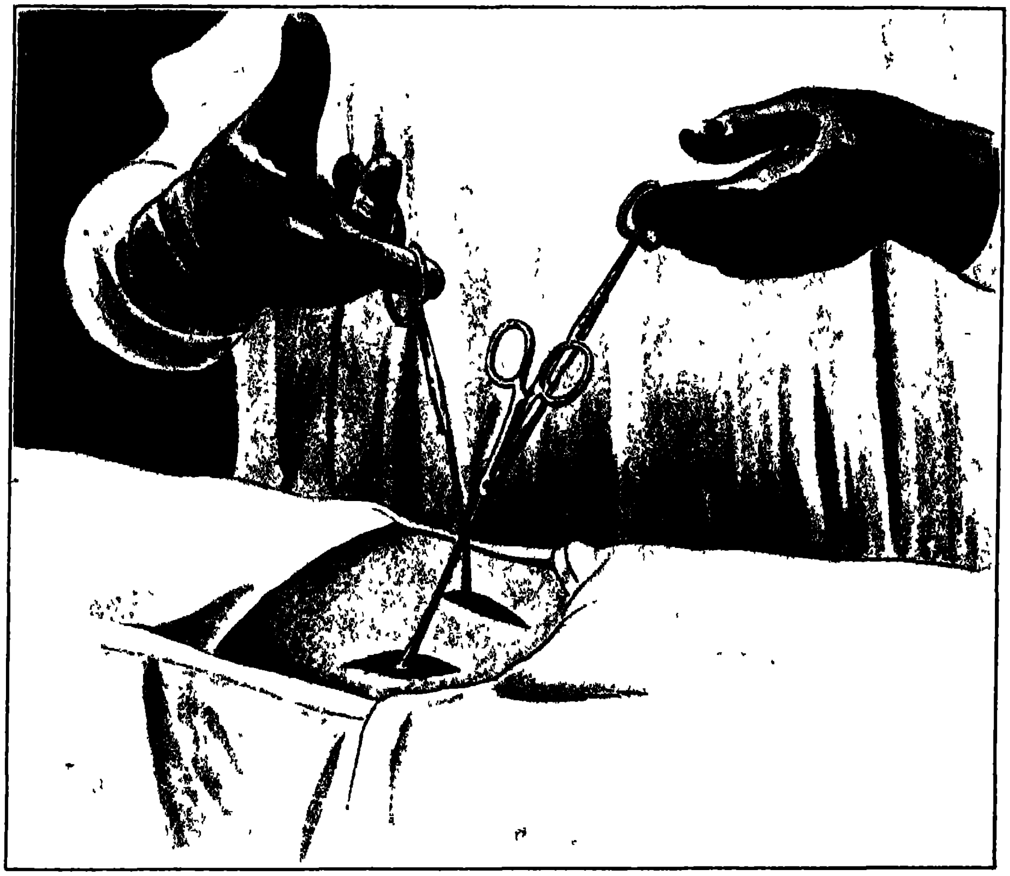
Fig 299.—Round ligaments crossed and fastened together in mid-line.

in reverse order through Poupart's ligament, floor of inguinal canal, round ligament, oblique muscle, and fascia. As the round ligament is sewed in place an assistant holds the hemostat grasping it in the middle line of the mons veneris so as to insure equal traction on both sides. The wounds are covered with silver foil, and gauze and collodion over which are placed dry sterile gauze and cotton held in place by strips of oxid of zinc plaster and an abdominal binder. It is safer, but not necessary, to insert a pessary before shortening the round ligaments, which remains in place for six weeks after the operation. A convenient time to insert the pessary is after the curetment which ordinarily precedes an Alexander operation, for almost every case of retroversion is complicated by a chronic endometritis with menorrhagia and leukorrhea. In a nulliparous woman there is apt to be severe dysmenorrhea, which indicates a forcible and extreme dilatation of the cervical canal as well as curetment.

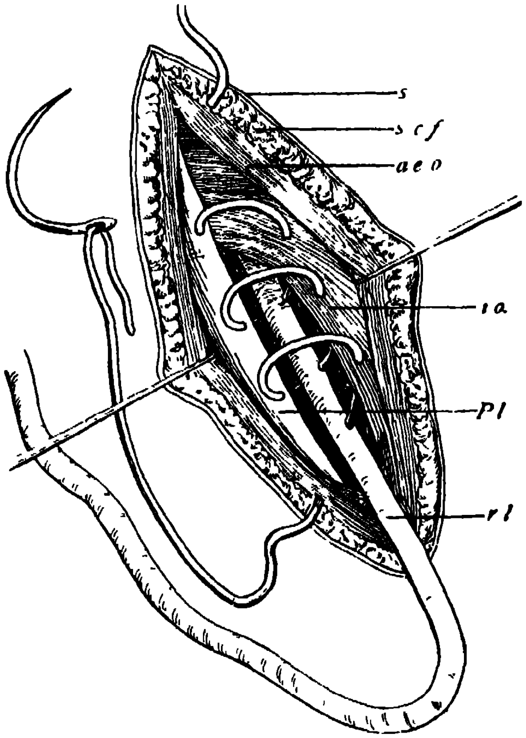

Fig. 300.—Deep tier of buried running suture of formalin catgut, embracing internal oblique and transversalis muscles, round ligament, and Poupart's ligament. Deep part of uppermost loop of suture (not showing in cut) passes at level of and embraces margins of internal ring: *s.*, Skin; *s. c. f.*, subcutaneous fat; *a. e. o.*, aponeurosis of external oblique, *i. o.*, internal oblique muscle, *r. l.*, round ligament; *P. l.*, Poupart's ligament.

Uterine Suspension.—An abdominal section and suspension of the fundus uteri from the anterior abdominal wall are indicated in the operative treatment of retroversion if there is disease of the appendages, pelvic adhesions, persistent prolapse of an ovary when the uterus is replaced, if the woman is very fat or has reached middle age, if there is a decided prolapsus uteri, and if the uterus is very much heavier and larger than normal.

The patient is prepared for an abdominal section (page 600). The abdomen is opened in the middle line by a medium-sized incision, the tubes and ovaries are pulled out by the fingers of the left hand and inspected ; if they are normal, the patient is raised in the Trendelenburg posture A ligature of fine silk threaded on a full-curved slender needle with a round point is passed through the peritoneum on the left side from below upward, through a few fibers of the rectus muscle from above downward and again through the peritoneum. The uterus is seized between the fingers and thumb of the left hand and lifted out of the abdominal wound. The needle is passed through the fundus for a distance of half an inch at a depth of a quarter of an inch in the median transverse line. The same needle is then passed through the peritoneum and some fibers of the right rectus muscle from below upward ; lastly, through the peritoneum from above downward. A second stitch is inserted in exactly the same manner a quarter of an inch above the first, running through the fundus uteri slightly posterior to the median transverse line. A gauze pad is passed into Douglas's pouch to clean out any blood that may have settled there, the stitches are tied in a double knot, bringing the fundus in close apposition with the anterior abdominal wall, an assistant holding

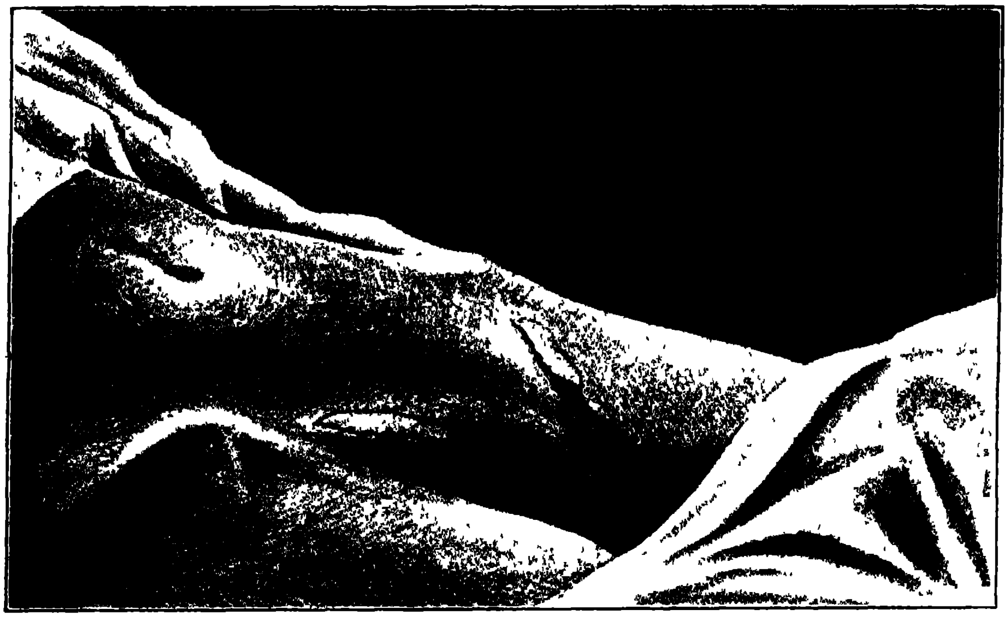

Fig. 301 —Groin wounds sutured.

two fingers behind the uterus while the knots are tied to prevent the inclusion of a loop of intestine. The patient is lowered to a horizontal position, the gauze pad is removed, and the abdomen is closed in the ordinary manner (page 630) The object of including a portion of the rectus muscle in the loop of the uterine suture is to secure a firmer hold and to prevent the recurrence of the displacement, which is by no means uncommon in the course of time or even immediately after uterine suspension if only the parietal peritoneum is included in the suspension stitch. At the same time the fixation is not so firm as to limit the mobility of the uterus or to interfere with subsequent pregnancies, the sutures soon cutting through the fundus and the adhesions formed between the fundus and the parietal peritoneum pulling out into a suspensory ligament an inch or two long and about as thick as a slate-pencil.

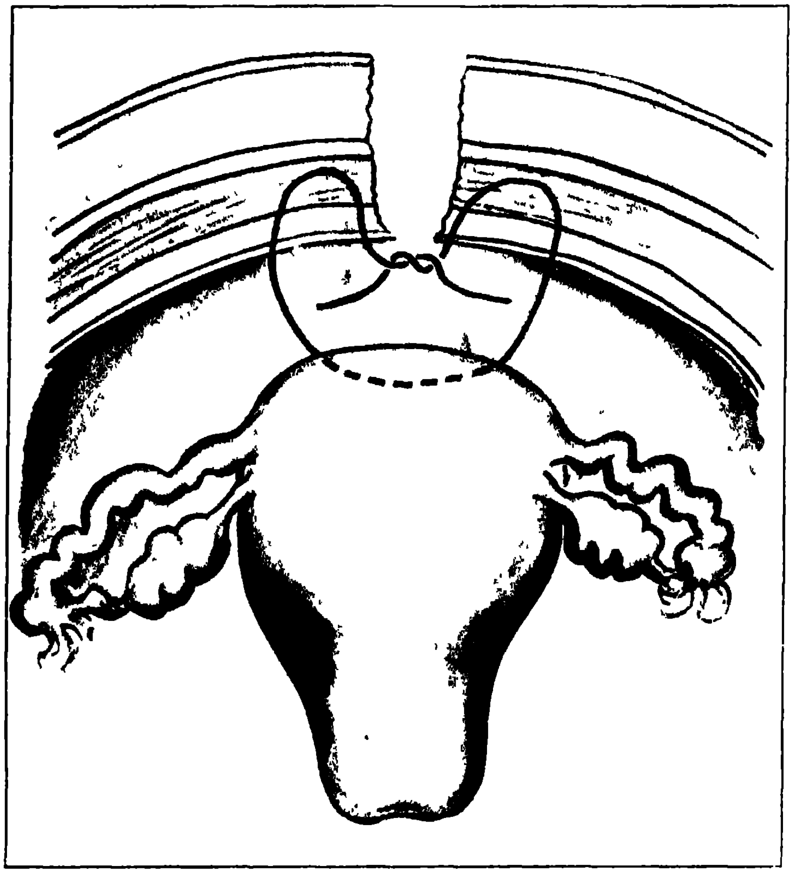

Fig. 302 —Suspension suture through fundus uteri, peritoneum, and a part of the recti muscles.

Uterine suspension can be completed much more quickly than shortening the round ligaments, requiring rarely more than ten or fifteen minutes all told. The saving of time, therefore, might determine one in favor of this operation in cases of multiple compound operations in one individual, as curetment, trachelorrhaphy, perineorrhaphy, and anterior colporrhaphy, followed by an operation for retroversion, especially if the woman's condition made the saving of time in the whole operation a consideration of great importance.

The operative treatment of retrodisplacement is a matter of election, as a rule, and should be selected voluntarily by the patient. If, however, she belongs to the working classes, it is justifiable to advise it urgently. A pessary in a working-woman who can not spare herself nor afford the proper medical attention at regular intervals is so unsatisfactory that it can not be recommended.

The results of the operative treatment are usually most gratifying. Local symptoms and reflex neuroses disappear Lines of care which make the face haggard fade out before the patient rises from bed The author has seen severe cases of epilepsy of some years' duration cured by a ventrosuspension of the uterus

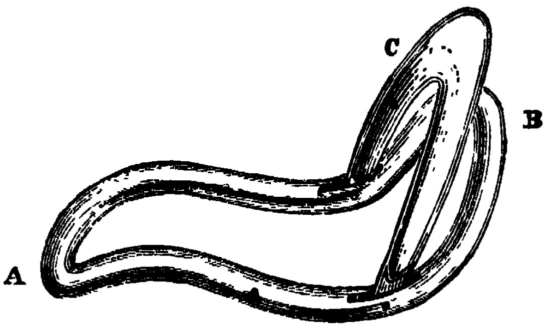

Fig. 303 —Thomas's anteversion pessary: A, Lower end resting just inside the vaginal entrance, B, upper end to be introduced in the posterior pouch of the fornix; C, anterior, movable bow, which is to lift the uterus through the anterior pouch of the fornix.

Anteposition, Anteversion, and Anteflexion. — The uterus may be pushed forward (anteposition) by a tumor back of it, as an enterocele, a retro-uterine hematocele, an abscess in Douglas's pouch, a fibroid tumor, or a very large mass of feces in the rectum. The symptoms of this displacement are dysuria and irritability of the bladder. The malposition of the uterus is corrected by the removal of its cause. Anteversion and a moderate degree of anteflexion are the normal positions of the uterus. A marked exaggeration of these positions, which is possible, may cause vesical irritability. Occasionally one sees an elongated and heavy uterus with the fundus lower and farther forward than normal, causing discomfort A physiological example of this displacement is seen in early pregnancy, and the irritable bladder which is a consequence is a well-known sign of the condition Exaggerated anteflexion is not infrequently seen. The uterus may have the shape of an inverted U. This displacement is the result of arrested development and is usually associated with a feebly developed nervous system. The nervous phenomena that often accompany such a displacement—neurasthenia and hysteria—are not a result of it. The physician, therefore, should be on his guard against directing his treatment to the uterus for nervous symptoms that will not in the least be benefited by it and may indeed be aggravated by frequent examinations and local treatment. Anteflexion of the degree described is a common cause of dysmenorrhea and sterility, and often requires treatment to meet these indications. (See page 386.) Much ingenuity has been devoted to the contrivance of mechanical devices to correct exaggerated anterior displacements. The Thomas anteversion pessary, the Hewitt cradle pessary, and the sleigh pessary of Schultze are the best of their class and are occasionally useful, but are not often employed now. An intra-uterine stem pessary, which would seem to be the most suitable imple-

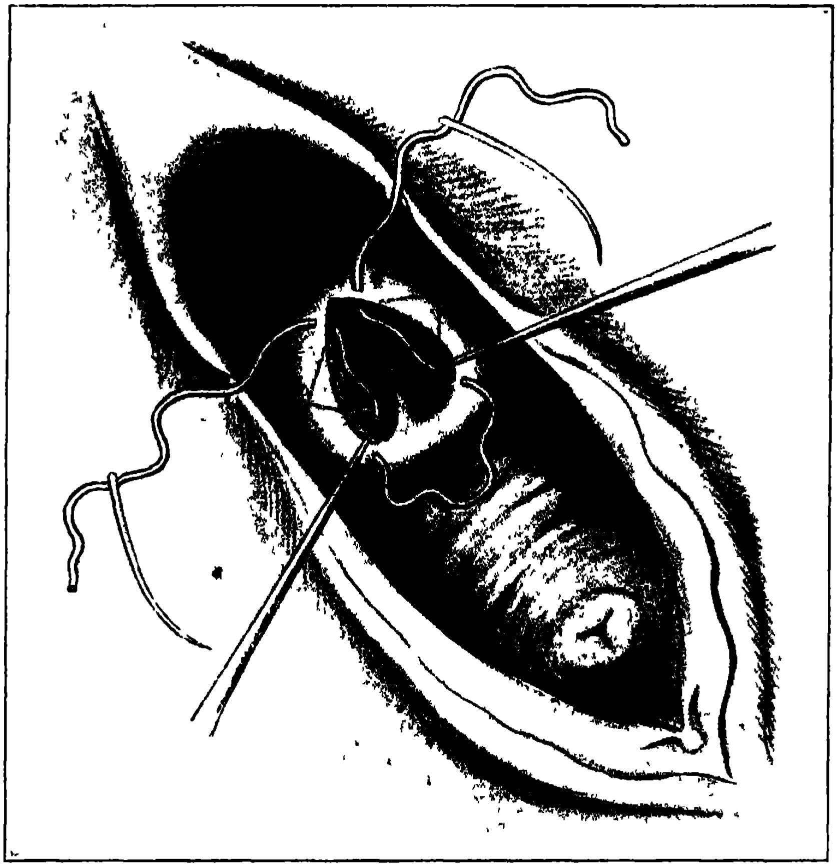

Fig 304 —Dudley's operation for anteflexion. The posterior lip of the cervix is split; two wedge-shaped excisions are made on both sides of the split cervix A purse-string suture is inserted, pulling the os further backward and straightening the cervical canal. A few interrupted sutures are required to unite the lateral extensions of the wound.

ment for the correction of anteflexion, can not be recommended, for the prolonged retention of any foreign body in the uterine cavity predisposes to infection of the endometrium and to a secondary infection and inflammation of the tubes and ovaries.

It has been proposed to make a cuneiform exsection (cuneohysterectomy[1]) of the posterior uterine wall for anteflexion. The author has no experience with the operation and doubts its justifiability as a routine procedure, but it is an ingenious proposition and might on occasion be worth remembering. Dudley's operation is the best, in the author's judgment, for the operative correction of anteflexion if anything more than forcible dilatation is required. By it the cervix is drawn upward and the

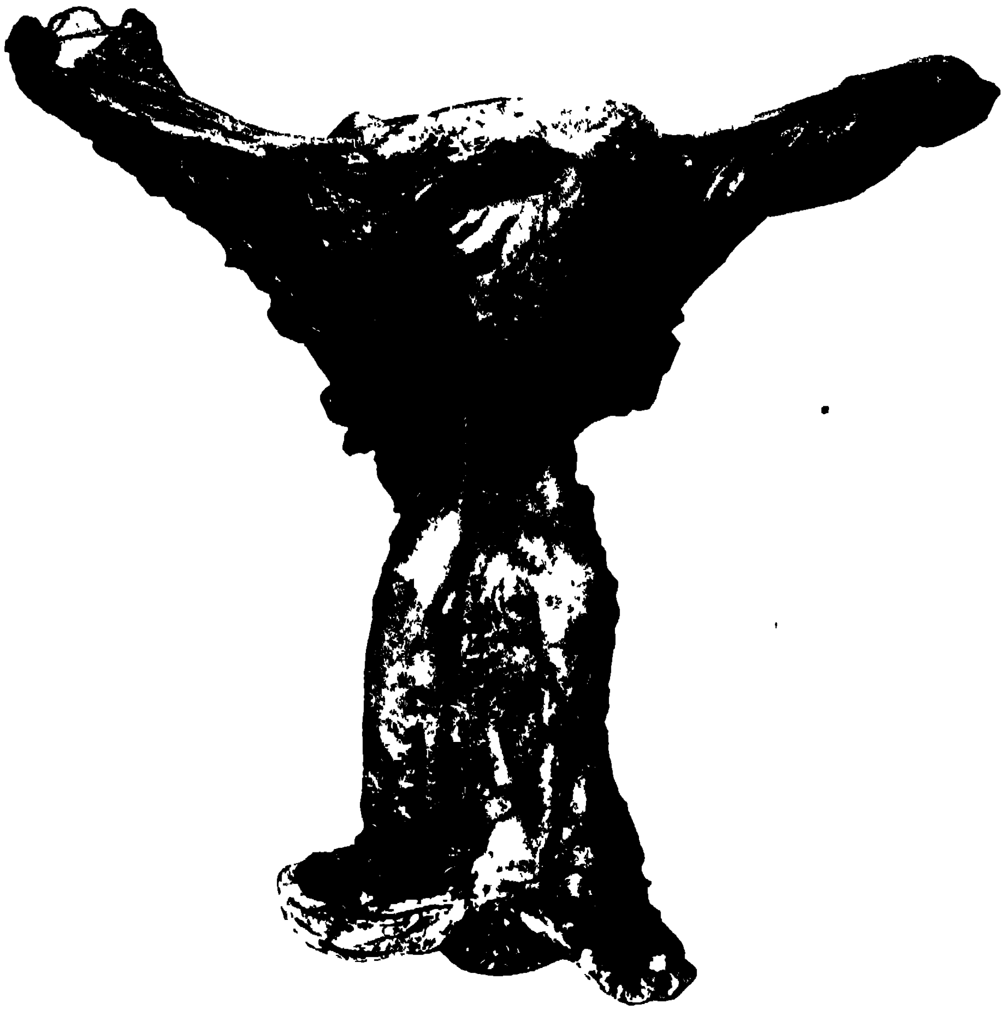

Fig. 305.—Enormous elongation of supravaginal portion of cervix and of the isthmus uteri. Internal measurement of uterus, 6½ inches.

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[1] Performed by Thirian in 1892; by Reed in 1894. See "Text-Book of Gynecology," Reed, 1901.

os is located farther backward, lessening the mechanical difficulties of menstruation and of the penetration of spermatozoa.

Anterior displacement with fixation of the uterus by inflammatory adhesion may be treated by tampons in the vagina, by section of the uterosacral ligaments, or by a vaginal or abdominal section to free the uterus and its appendages from adhesions.

Prolapsus Uteri.—If the cervix uteri, not congenitally elongated, descends to or beyond the vulva, and its descent is accompanied by some degree of inversion of the vagina, the condition is called prolapse of the uterus. It is customary to draw a distinction between partial and total prolapse of the uterus, the latter condition existing when the whole uterus lies outside the vulva. There is always some degree of inversion of the vagina. The inversion of the vagina may be complete while the fundus uteri remains almost or quite at a normal level. Such a case is explained by an enormous elongation of the lower uterine

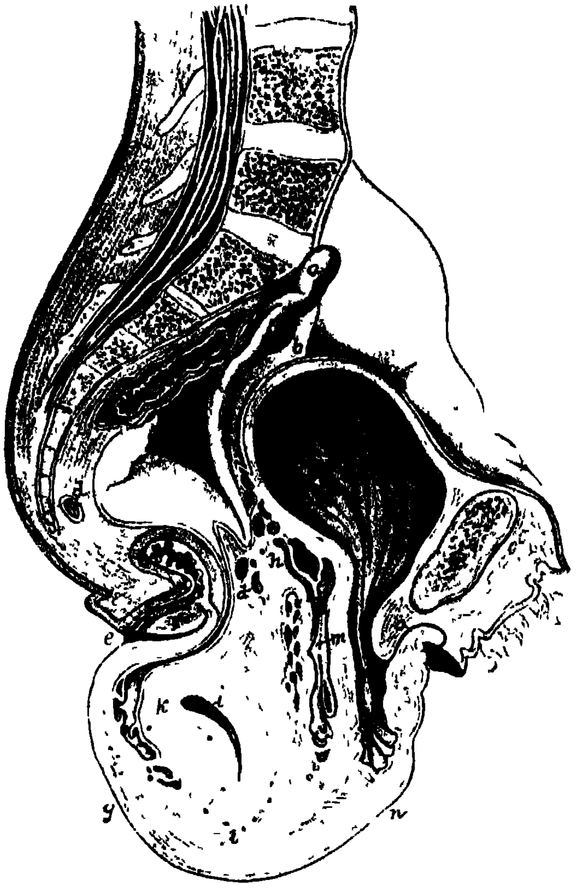

Fig. 306.—Median section of a woman with complete prolapse of the uterus: a, Dilated left tube; *b*, left broad ligament; *c*, rectum, *d*, blood-vessels, *e*, anus; *f*, perineum; *g*, prolapsed posterior vaginal wall, *h*, Douglas's pouch, *i*, uterine cavity, *k*, fundus uteri, *l*, obliterated cervical canal; *m*, vesico-uterine pouch; *n*, prolapsed anterior vaginal wall; *o*, urethra; *p*, cystocele (Spiegelberg).

segment or isthmus uteri permitting a descent of the cervix several inches outside the vulva while the fundus and corpus uteri are held at almost a normal level by the uterine ligaments.

Owing to its firm attachment to the cervix, the bladder always accompanies the descent of the anterior vaginal wall, and the upper part of the urethra likewise follows the descent of the bladder, so that the urethra runs a curved course from the external meatus above to a prolapsed segment of the bladder below. The bladder is divided practically into two segments, one accompanying the prolapse of the anterior vaginal wall and lying outside the vulva, the other remaining in the pelvic cavity (Fig. 306).

Such a mechanical arrangement makes the complete evacuation of the bladder impossible. The residual urine undergoes decomposition, there is cystitis, and infection may spread to the kidneys along the ureters, resulting possibly in a fatal pyelitis.

The rectum follows the prolapse of the posterior wall to a certain extent, but not nearly so completely as the bladder does that of the anterior vaginal wall, and perhaps not at all because of the loose connective tissue between the anterior wall of the rectum and the posterior wall of the vagina, which stretches readily. Douglas's pouch, however, is necessarily elongated, and beneath the inverted posterior vaginal wall lying outside the vulva there is commonly a segment of reduplicated peritoneum If the uterus lies completely outside the vulva, as it may, it is usually in a position of retroversion or flexion. In elderly women with a small atrophied uterus, the position in total prolapse may exceptionally be one of anteversion The prolapsed uterus is usually much enlarged, especially the cervix, which is often enormously broad If the fundus uteri remains in the pelvic cavity the uterus is much lengthened A measurement of six or more inches by the sound is not uncommon. The increase in breadth is due mainly to edema; that in length, to stretching. When the uterus is replaced and held in place by tampons, its size rapidly diminishes.

Etiology.—In accounting for prolapse one must differentiate the commoner cases following childbirth from those that occur in nulliparous women. The explanation for prolapse in women who have borne children is found in a combination of physical conditions and in the woman's mode of life. There has been an injury of the muscle of the urogenital trigonum and a detachment of the anterior vaginal wall from its subjacent attachments. The prolapse of the anterior wall which follows drags upon the cervix, pulls it forward and downward, and produces a retroversion of the uterus if such a malposition did not already exist The retroversion brings the long axis of the uterus in coincidence with the long axis of the vaginal canal and renders the descent of the former along the latter easy. There has also been an injury of the pelvic floor, a laceration of the levator ani muscle, resulting in a prolapse of the posterior vaginal wall, which pulls upon the posterior lip of the cervix, dragging it downward, helping to tilt the fundus over backward, and assisting in the descent of the cervix The woman almost always belongs to the working classes. Her laborious life, with hard work for hours at a time on her feet, increases the intra-abdominal pressure and in time drives the uterus out of the pelvis in the direction of least resistance along the relaxed vagina, until the latter is partially or entirely inverted. The retroverted and particularly the partially prolapsed uterus becomes congested, edematous, and heavy. Its increased weight helps its descent. The middle-aged or elderly woman usually stoops; the inclination or obliquity of the pelvis is decreased; hence the abdominal contents press more directly upon the pelvic viscera. The degree to which the whole uterus descends depends entirely upon the strength of the uterine ligaments, particularly the cardinal and the uterosacral ligaments If they are weakened by the muscular atrophy of middle and advanced age, in which prolapse usually occurs, and by the absorption of the pelvic fat, and if they stretch inordinately under the extra strain imposed upon them, the whole uterus descends and may protrude in its entire length outside the vulva. If the ligaments resist the descent of the uterus, the complete inversion of the vagina is still possible, dragging the cervix outside the vulva the full length of the vaginal walls, while the fundus remains well within the pelvic cavity Such a result is rendered possible by the elasticity of the lower uterine segment, which stretches to an extraordinary extent in order to allow the protrusion of the cervix from the vulva. This variety of prolapse, which is commoner than the total prolapse of the uterus, was formerly ascribed to a "supravaginal elongation of the cervix." It is not, however, the cervix alone, but, as already stated, mainly the lower uterine segment which is elongated. A complete inversion of the vagina has followed a firm ventrofixation of the uterus. The fundus remaining attached to the abdominal wall, the cervix has protruded from the vulva almost the entire length of the vagina.

It is more difficult to explain prolapsus uteri in nulliparous women. The condition may be congenital, but such cases are very rare. It may develop in young women, although it is more commonly observed at and after the menopause. The author has seen two cases of total prolapse in young girls which were apparently due to premature and excessive sexual intercourse. One of these patients was seventeen years old. She had been a prostitute since the age of eleven. The vaginal walls had been overstretched, their attachments weakened or injured, and there had probably been a retroversion of the uterus with an increase of intra-abdominal pressure.

In elderly women there is probably a combination of retroversion, weakening of the uterine ligaments, and increased intra-abdominal pressure. In one of the author's cases there had been a violent and almost incessant asthmatic cough for years.

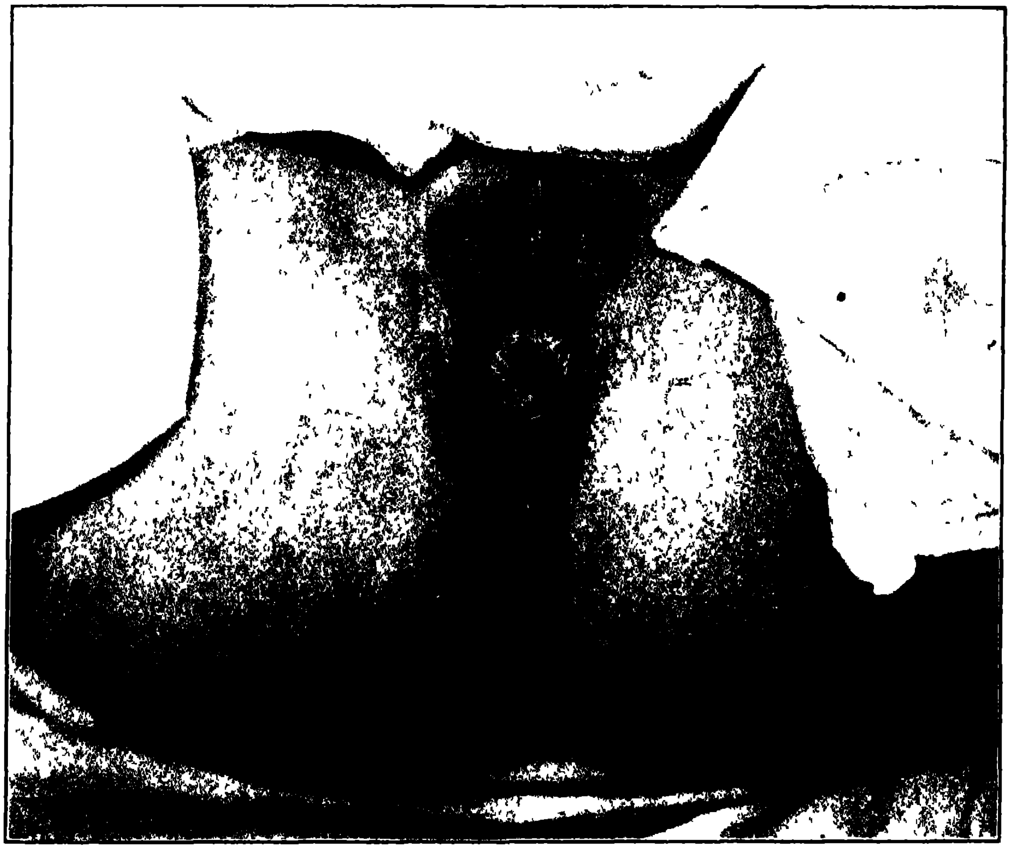

Fig. 307.—Partial prolapse of the uterus.

Finally, one must always think of the possibility of an intrapelvic or of an intra-abdominal tumor or of ascites forcing the uterus out of the pelvis in the direction of least resistance.

Clinical History, Symptoms, and Diagnosis.—The woman is usually of the working class. Prolapsus uteri is a disease of the poor, not of the well-to-do. She has usually borne children and is of middle age, although prolapse is possible in nulliparous women and in young girls. The patient ordinarily gives the history of a precedent retroversion, rectocele, and cystocele.

The actual protrusion of the uterus often occurs suddenly in consequence of some exertion, and may be the first symptom to attract the patient's attention. After the prolapse is evident to the patient, if not before, she suffers from dysuria and irritable bladder; backache and bearing down; difficult locomotion and a constant irritation of the protruding mass and usually of the inner thighs, which are moistened with the urine that flows over them and are irritated by the urinary salts that accumulate upon them. A disagreeable odor is noticed on account of the difficulty of keeping the parts clean. A constant discharge is often complained of due to a weeping from the cervical canal and uterine cavity, the result of edema, of a hyperplastic endometritis, and of ulcerations around the cervix. There may also be the dribbling urine of an overfilled bladder, the paradoxical incontinence of retention.

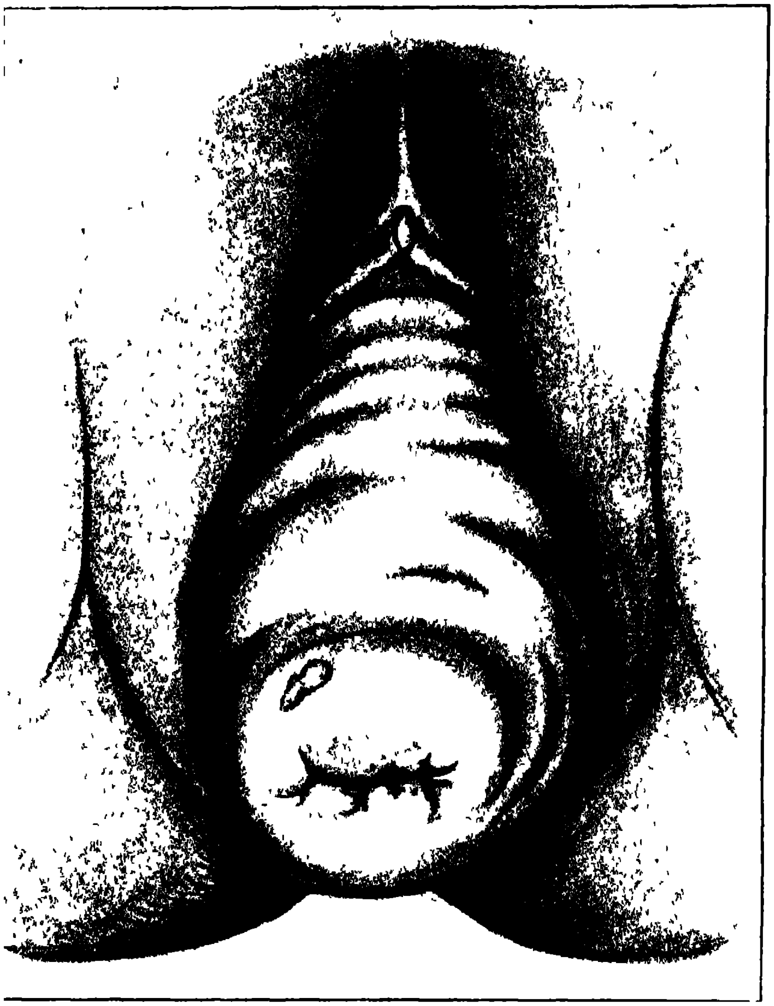

Fig. 308.—Complete inversion of the vagina and prolapse of the cervix in a pregnant woman.

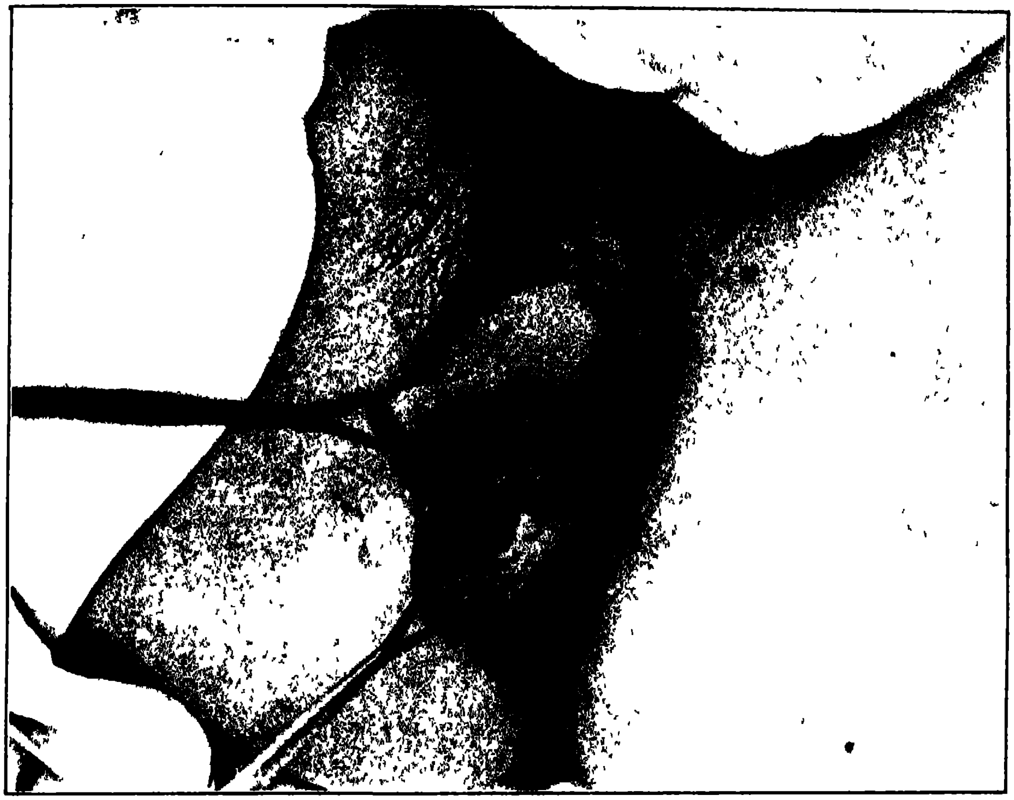

Fig. 309.—Prolapse of the uterus with bilateral laceration of the cervix.

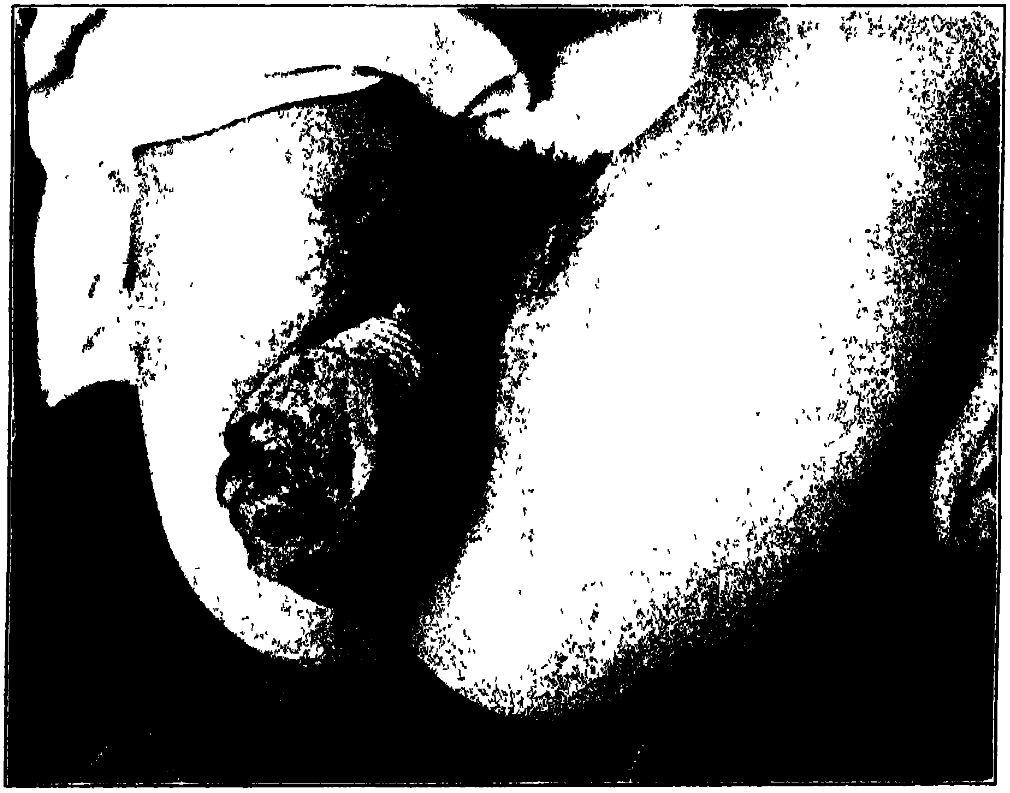

Fig. 310.—Complete inversion of the vagina; prolapse of the cervix, which is hypertrophied and eroded.

If the patient is examined in the dorsal position, the full degree of prolapse which is present in the erect posture may not be appreciated. Cases apparently of partial prolapse, therefore, should always be examined in the erect posture. Commonly, if the prolapse is complete, there is no mistaking it in any posture (Figs. 310, 312). A huge cylindrical mass protrudes from the vulva; the vagina is obviously completely inverted; the external os uteri is evident; the prolapsed segment of the bladder gives a peculiar fullness to the anterior vaginal wall, and something of the same sort is often noticed on the upper portion of the posterior vaginal wall, where there may be a rectocele or a bulging of the prolapsed reduplication of the peritoneum Around the cervix there is often ulceration due to defective nutrition from the interference with the circulation. The vaginal mucous membrane is usually much thickened, dry and harsh in feel. It may be possible to palpate the whole of the uterus outside the vulva through the inverted vaginal walls. If a part of the uterus

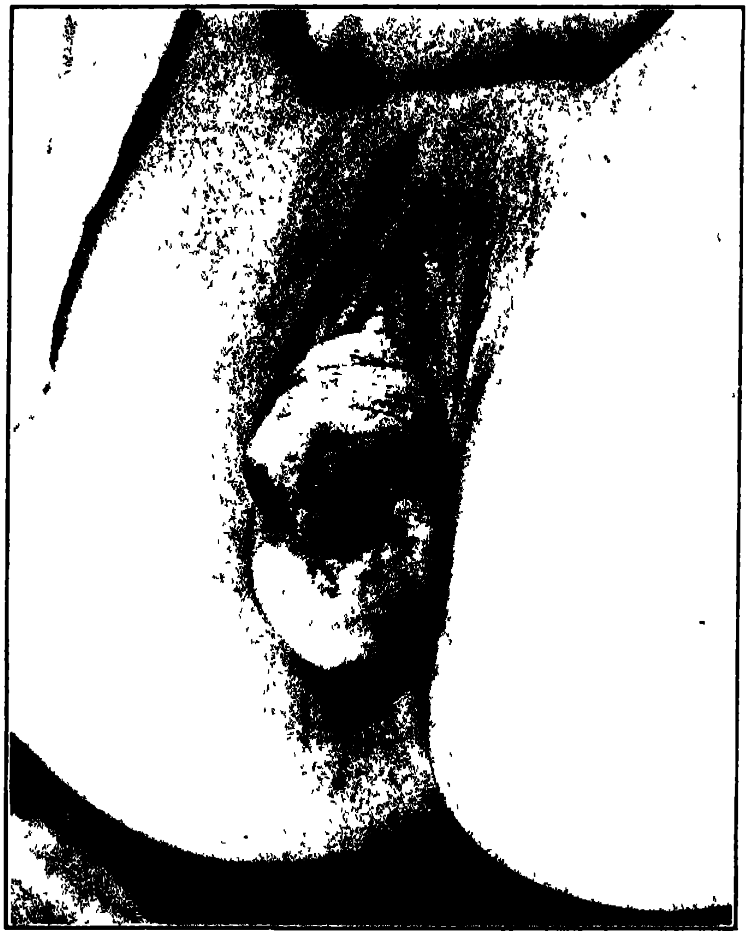

Fig. 311.—Partial prolapse of the uterus with hypertrophied and lacerated cervix.

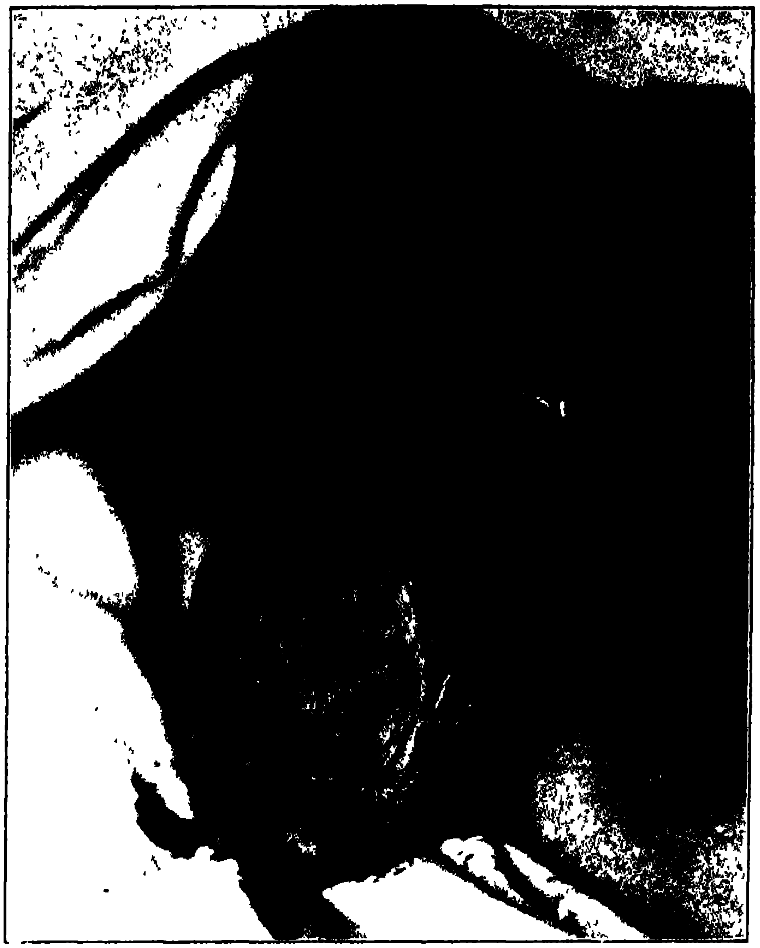

Fig 312.—Total prolapse of the uterus.

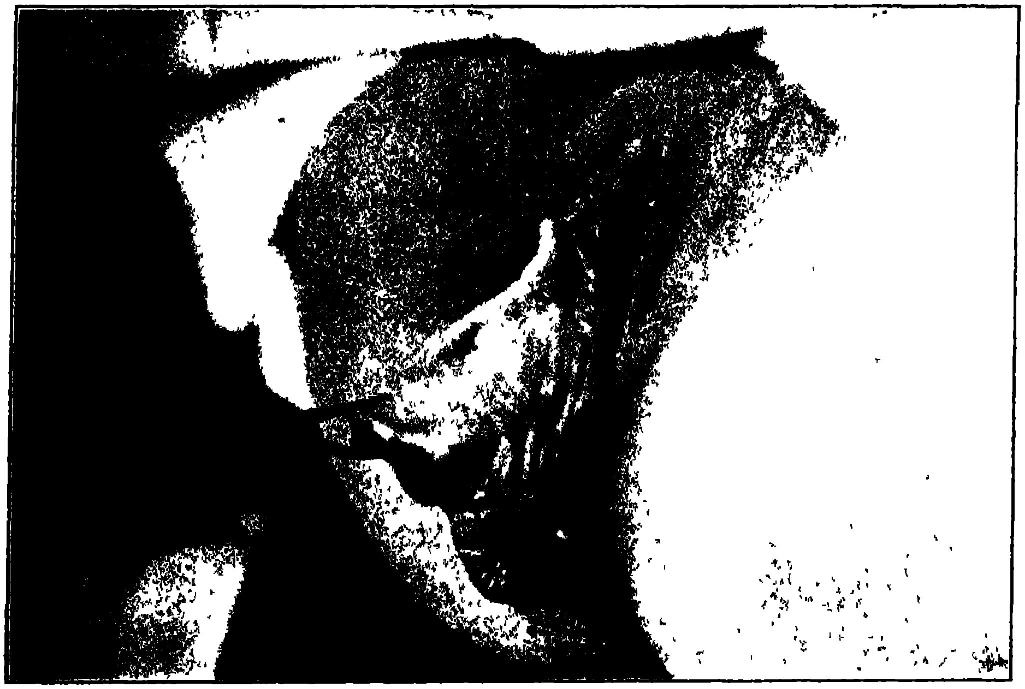

Fig. 313.—Prolapse of uterus and detachment of posterior vaginal wall.

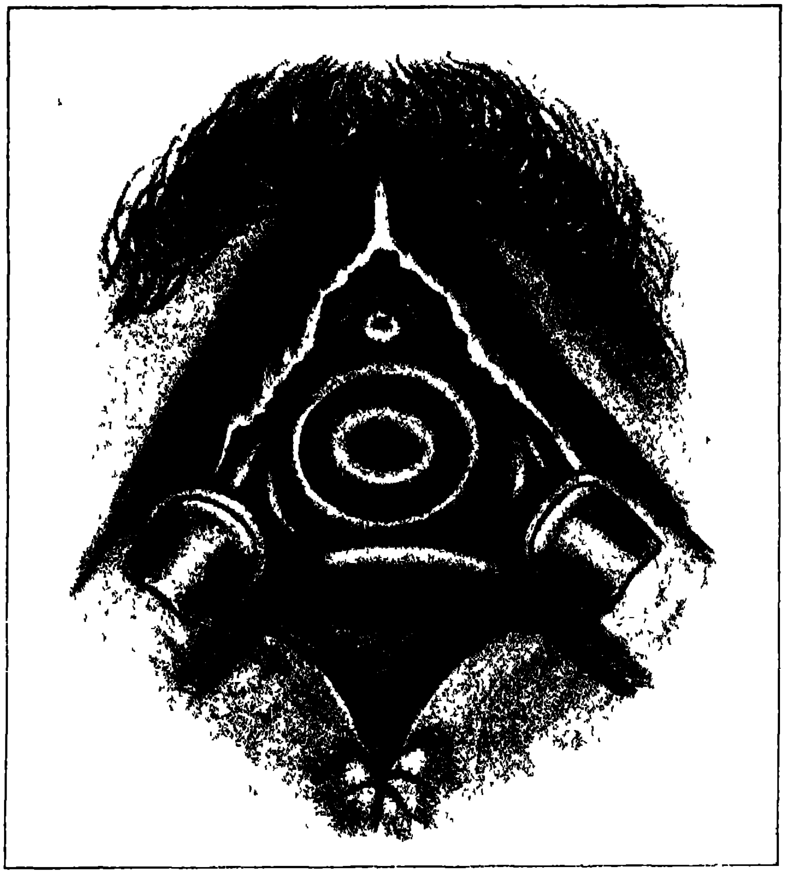

Fig. 314.—Partial prolapse of the uterus in a virgin, with intact hymen.

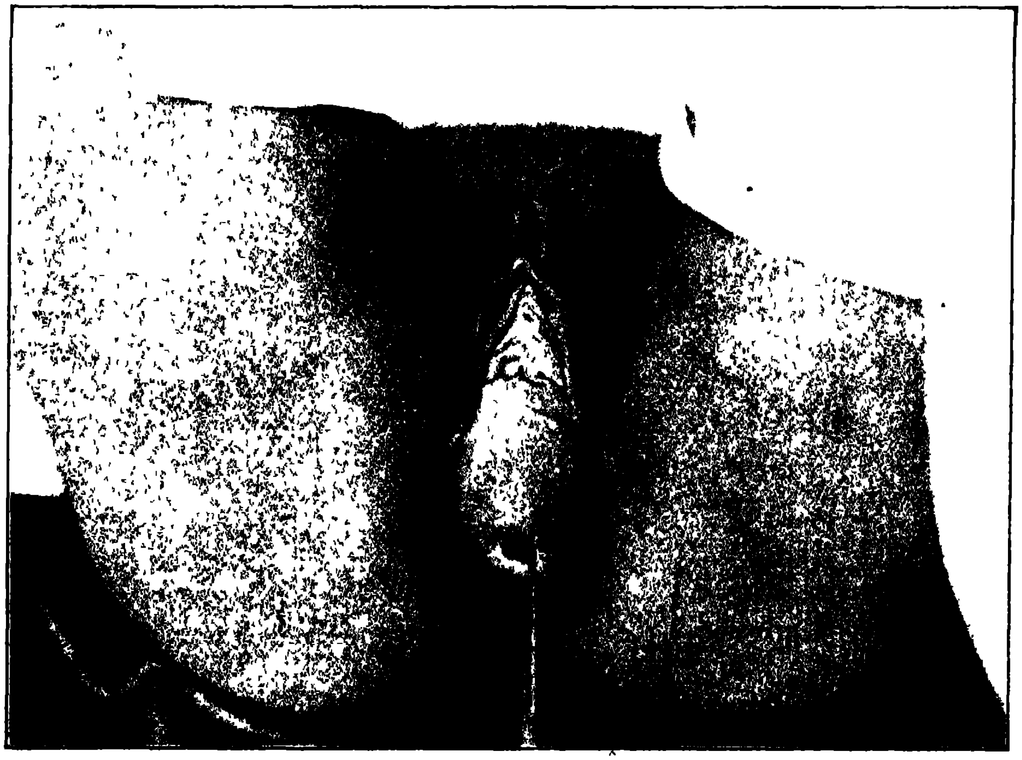

Fig. 315.—Total prolapse in a nulliparous woman.

remains within the pelvis, this fact and the position of the fundus are demonstrated by a recto-abdominal examination. While total prolapse may be diagnosticated at a glance, a bimanual examination of the pelvic contents should never be neglected, for occasionally the uterus is forced out of the pelvis by a tumor or by ascites, which might not be recognized until the operation for simple, uncomplicated prolapse were undertaken.[1]

It is usually better to reduce the prolapse and to examine the pelvic organs by a combined vaginal-abdominal examination.

Prolapsus uteri of itself is rarely fatal. The author has seen two cases of strangulation of a prolapsed uterus, gangrene of the uterus and fatal peritonitis. In one a hysterectomy was immediately performed without avail; the other woman was moribund when she was brought to the hospital.

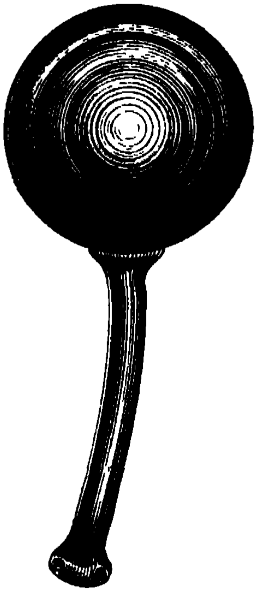

Fig. 316.—Globe pessary with stem

Treatment.—The first object of treatment is to reduce the prolapse. This is usually easy. Seizing the uterus between the thumb and fingers, steady pressure is made in the axis of the vaginal canal, whereupon the uterus and the inverted vagina return within the pelvis. The patient should then be put in the knee-chest posture and with the aid of a Sims' speculum the vagina is packed with wool tampons saturated with boroglycerid, which are allowed to remain in place forty-eight hours. If possible, the patient should be confined to bed for a few days in order that the congestion and edema of the uterus shall be reduced as rapidly as possible. Occasionally it may be difficult to return the prolapsed uterus within the pelvis, on account of its edema and enlargement. It may be necessary to elevate the foot of the bed in which the woman lies, to apply ice water and glycerin compresses to the uterus, and even to resort to multiple punctures of the cervix or local bloodletting, before the uterus can be replaced. Smearing the vaginal walls with an unguent before attempting reduction by taxis is of advantage. Having reduced the prolapse, the physician must decide upon the subsequent treatment of the case, whether he shall advise radical cure by operation or the use of a mechanical support. The former is much the more satisfactory treatment and is as a rule to be recommended, but it may be impracticable in individual instances because of the patient's age, her general condition, or because she refuses operation. Hence it is occasionally necessary to employ a mechanical support. Many different pessaries for a prolapsed uterus have been devised, but the author has for some years employed but two, a moderate-sized globe pessary on a stem supported by an abdominal belt and rubber tubing, or the Goddard pessary The latter is more suitable for unintelligent women of the poorer classes. The efficiency of a support modeled on a globe pessary is often instinctively recognized by the patient herself. One of the author's patients every day inserted a wad of newspaper rolled into a ball; two others inserted a fresh apple into the vagina every morning. They had thus made themselves fairly comfortable for years.

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[1] The author once made this mistake through carelessness. His chief of dispensary called his attention to a case of prolapse which was obvious at a glance. The woman was admitted to the hospital for operation. Brought into the operating room in her turn the following day, a large abdominal tumor was discovered which proved later to be cancerous.

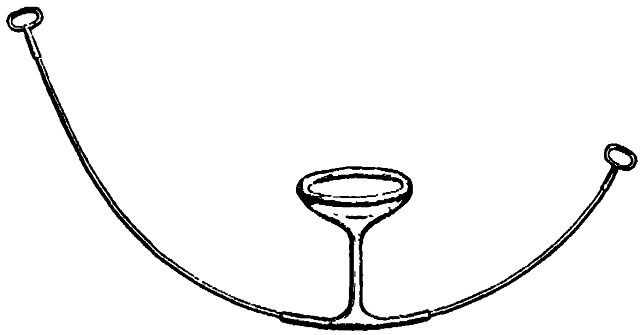
Fig. 317.—Goddard pessary

If an operation is determined upon, as it should be, unless there is good reason against it, the physician must decide whether to trust to a plastic operation alone or whether the plastic operation should be reinforced by suspending the uterus to the abdominal wall The following considerations should govern his choice: Prolapse in nulliparous women can not be cured by a plastic operation alone; the suspension of the uterus in addition is necessary. If the woman is of childbearing age and is living with her husband, so that an extreme narrowing of the vagina is inadvisable, the suspension of the uterus should be added to the plastic operation. If there is complete inversion of the vagina with the prolapse of the cervix by the so-called supravaginal elongation while the uterine fundus remains at a good level in the pelvis, a plastic operation alone is often sufficient If the woman is at or past the menopause and coitus need not be considered, a plastic operation with exaggerated narrowing of the vagina will probably suffice.

This important point being decided, the form of plastic operation to be undertaken must be settled. Individual judgment naturally differs on this question For years the author has depended with uniform success in suitable cases upon an extensive Martin's anterior colporrhaphy with the tier suture of catgut, a high

Hegar's amputation of the cervix and a very extensive Hegar's operation upon the posterior vaginal wall, the apex of the denudation reaching almost to the cervix and its base being as broad as possible. These operations are described elsewhere. It is only necessary here to call attention to certain essentials in the technic of their combination. The cervix is seized with a double tenaculum and dragged forcibly outward; the area to be denuded on the anterior vaginal wall is marked out by an oval incision with a sharp knife. The circular incision for the cervical amputation is then made, and the cervix is partly freed by dissection of

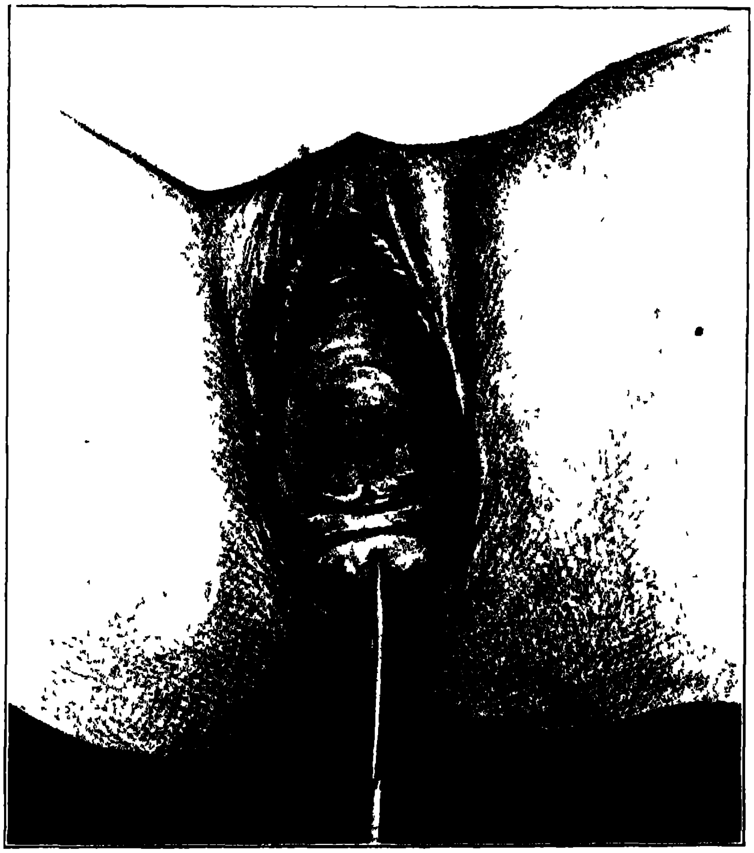

Fig. 318.—Incisions for the anterior colporrhaphy and amputation of the cervix for prolapse.

the vaginal mucous membrane upward. The denudation of the anterior wall is completed by dissecting off the oval flap in one piece by a knife; the amputation of the cervix at the level of the internal os is completed, including the insertion and knotting of the catgut sutures; double tenacula seize the stump of the cervix and pull it down; the tier suture is inserted in the anterior vaginal wall, beginning just below the urethral orifice; if there is tension on the last tier of the running suture, the cervix is released and the uterus is pushed up into the pelvis, whereupon it is easy to bring the edges of the mucous membrane of the anterior vaginal wall together. The cervical amputation and anterior colporrhaphy being completed, the uterus pushed up to its normal level in the pelvis, the posterior colporrhaphy by Hegar's method is performed. The sutures in the upper part of this wound may be of catgut; the lower sutures and those in the perineum should be of silkworm-gut, shotted.

European statistics show discouraging results in the operative treatment of prolapsus uteri. On the average ultimate failure is reported in about 30 per cent. of the cases. This is certainly not the author's experience. The operations above described have been performed frequently as routine work in his hospital services for more than fifteen years. The patients have numbered considerably more than 100. Not one of them has reapplied on account of a recurrence. Naturally, some of them, in case of failure, would apply to other clinics; but if the proportion had been as large as a third, a few at least would have reappeared. The ill success of the operative treatment of prolapse on the continent of Europe may be explained, perhaps, by the hard manual labor performed by women of the peasant and laboring classes. In consequence of this ill success many radical and some bizarre procedures have been adopted. The uterus has been turned out of the anterior vaginal vault by anterior colpotomy and sewed in the vagina, upside down, to the anterior vaginal wall; or sewed to both anterior and posterior walls, an artificial os being made in the fundus (Wertheim, W. A. Freund). The anterior vaginal wall has been suspended to the retrosymphyseal connective tissue. The uterosacral and the infundibulopelvic ligaments have been shortened. The bladder has been suspended to the pelvic connective tissue. Douglas's pouch has been partially or wholly obliterated. Vaselin has been injected under the anterior vaginal wall, and quinin solution into the parametrium, to produce a cellulitis! Finally, the uterus and the whole vagina have been exsected. The proportion of permanent cures has not been increased by these procedures, except by the last, which, however, is scarcely ever justifiable.[1]

Inversion of the uterus is a displacement in which the uterus is partially or completely turned inside out. The cervix is almost always unaffected by the inversion, forming a collar around the isthmus of the inverted corpus and opposing by the contraction of its circular fibers the reposition of the bulky corpus and fundus through its contracted ring. Inversion of the uterus is very rare. Many experienced gynecologists have never seen a case.

Etiology.—Inversion of the uterus occurs in labor during or after the third stage, or is the result of a polypoid tumor depending from the fundus. In the latter case the weight of the tumor depresses the fundus, and the contraction of the uterine muscle in efforts to expel the tumor increases the traction on the fundus, until it is inverted.

Symptoms and Diagnosis.—If an inversion originating in childbirth is not corrected, the symptoms after the completion of puerperal involution are metrorrhagia, leukorrhea, backache, a sense of drag and bearing down in the pelvis, and inability to remain long or to make exertion in the erect posture. On examination three degrees of inversion may be discovered: in the first, the fundus remains within the cervical canal; in the second it protrudes into the vagina and the corpus may be completely inverted, although if involution is normally completed the fundus may not descend much more than an inch below the external os, in the third degree prolapsus is associated with inversion and the inverted uterus hangs outside the vulva

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[1] Baumm, "Arch. f. Gyn.," Bd. lxv, H. 2. Bucura, "Zeitschr. f. Geburtsh.," xlv, 3. H. W. Freund, "Centralbl. f. Gyn.," No. 18, 1901. Stone, "Amer. Jour. of Obstet.," 1901, p. 675.

On a bimanual examination, especially a recto-abdominal examination, the absence of the uterine body from its normal situation is noted and a cup-shaped orifice or a slit is felt at the upper margin of the cervix, into which the uterine appendages may be prolapsed. A finger or a sound, if inserted past the projecting fundus into the external os, only enters the depth of the cervical canal, about two centimeters.

The condition which may be and has been most often mistaken for inversion is a polypoid tumor protruding from the external os, but the differential diagnosis should not present insuperable difficulties. The uterine cavity has a normal or increased depth, a bimanual examination demonstrates the uterine body in its normal situation, and by traction on the polyp its attachment to the cervix or uterine wall by a pedicle may be determined. A uterine polyp is, moreover, usually very much firmer or very much softer than the uterus itself, as it is fibrous or mucous. A cystic polyp, giving the sensation of a hollow tumor, may, however, feel much like the uterine body. Occasionally the cervical canal is obliterated by adhesions between the endometrium and the periphery of a polyp. Even in such a case, although it is impossible to demonstrate the existence of a uterine cavity, a bimanual examination detects the uterine body where it should be If the inversion is caused by a tumor attached to the fundus, there are all the signs of the inversion, and the origin of the tumor from the fundal endometrium is in plain sight if the former is pulled upon and the inverted fundus is brought outside the vulva. The feel and the appearance of the tumor, moreover, present a sharp contrast with the uterus, especially if the former, as is often the case, has partially sloughed from a deficient blood-supply due to the compression of the vaginal walls and to the displacement of the uterus.

Treatment.—In no other disease of women is there such a diversity of opinion as to the proper treatment. The primary object of all the numerous measures advocated is, of course, the reinversion of the uterus. This may be accomplished in three ways: by taxis, by long-continued pressure, and by operative treatment

The Reduction of Inversion by Taxis.—This method should always be adopted as soon as the inversion is recognized after labor, and if resorted to without too much delay should always be successful. It may become impracticable if the cervix is allowed to recover its contractile power after labor If weeks, months, or years have elapsed since the inversion, attempts at taxis are likely to fail, but should always be made under anesthesia before resorting to other plans of treatment. Excessive force and injudicious persistence, however, may perforate the uterus or so bruise it that sloughing results. In either case there may be a fatal result The following plans of applying taxis have been successful: (1) Inserting the whole hand into the vagina, surrounding the isthmus uteri within the cervix with the fingers and thumb, making pressure upon the fundus with the palm of the hand, and counterpressure upon the cervical ring above through the abdominal walls (Emmet). (2) Placing the thumb and middle finger against the uterine horns, making pressure first upon one and then upon the other, and, after reinverting the horns, replacing the fundus, counterpressure being made upon the cervix from above (Noeggerath) (3) Making pressure with the finger-tips of one hand against the lateral wall of the lower uterine segment in a direction forward and upward while an assistant with both hands presses upon the cervical ring from above and endeavors to dilate it by traction in opposed directions through the abdominal walls. The author has reduced five cases of inversion in this manner. (4) Inserting two fingers into the rectum and making traction upon the cervical ring, while pressure is applied with the other hand to the fundus (Courty) (5) Inserting two fingers in the rectum, the forefinger of the other hand in the bladder through a dilated urethra, making traction upon the cervical ring, while the two thumbs press upon the uterine fundus (Tate, of Cincinnati).

The Treatment of Inversion by Long-continued Pressure.—Various plans have been devised to exert pressure upon the fundus for hours and days, thus gradually replacing it Colpeurynters distended with water and air have had their advocates This method, when it succeeds at all, requires at least a week, perhaps a month; the patient experiences great pain, and can not endure the pressure for more than five or six hours at a time. There is likely to be high fever, and there may be fatal infection Repeated packings with iodoform or sterile gauze are not so objectionable, but do not often succeed. White, Aveling, and others have used curved and S-shaped rods with a cap at the inner end to press upon the fundus while elastic pressure was applied from without by various devices, such as rubber bands fastened to an abdominal belt and a spiral spring supported by a T-binder A stethoscope has been employed with the cup against the fundus and ligatures passed through the cervix and drawn taut through the earpiece. If the fundus is partially reduced, Emmet's proposition to close the cervix over it with wire sutures may be worth remembering. The steady traction on the cervix and the pressure on the fundus may complete the reduction of the displacement Success has been achieved with all these appliances, but it is always problematical and none of them is free from danger.

The Operative Treatment of Inversion.—The following plans have been proposed for the correction of an inversion by operation: Discission of the cervix; abdominal section, dilatation of the cervical ring from above, and reposition of the fundus by direct traction upon it, median posterior hysterotomy, dilatation of the cervical ring through the incision, closure of the wound, and reposition of the uterus or repair of the uterine wound after reposition by posterior colpotomy; median complete division of the cervix and uterine wall to the fundus either anterior or posterior, with colpotomy to permit the repair of the uterine wound after reposition, vaginal hysterectomy.[1]

Of these operations, discission of the cervix is the least formidable and should often succeed The cervix is cut in two to or through the peritoneum in the median line posteriorly; taxis is employed, and after the reposition of the uterus the cervical wound is closed by interrupted sutures of silkworm-gut, the higher sutures shotted in the posterior vaginal vault, the lower upon the vaginal portion of the cervix The author has thus reduced a complete inversion of the uterus of three months' duration that had resisted taxis at the hands of three gynecologists on different occasions. If the complete division of the cervix is insufficient, the incision is carried through the uterine wall also, an effort to reduce the displacement by taxis being made with each extension of the incision, which need scarcely ever, in the author's judgment, be carried to the fundus After reposition the uterine wound must be united through the incision of a posterior transverse colpotomy in the vaginal vault, the uterine muscle being joined by a tier suture of catgut, the peritoneum by close-set interrupted sutures. The cervix may be united by an extension of the uterine suture or by separate interrupted sutures. If there is no oozing to speak of after the closure of the uterine wound, the vaginal wound may be closed; otherwise drainage must be provided by a strip of gauze in Douglas's pouch, removed in forty-eight hours, and replaced, if the discharge continues, by a T-shaped rubber drainage-tube. Division of the cervix and of the uterus in the anterior median line after separating the cervix from the bladder has the advantages that adhesions along the line of the wound do not predispose to retrodisplacement of the uterus, and that an anterior T-shaped colpotomy makes the uterine wound more accessible for suturing, but there is a chance of injury to the bladder and drainage is not so easily secured.

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[1] A complete bibliography of the operative treatment of inversion may be found in the article by Oui, in the "Annales de Gyn et d'Obstet.," Oct and Nov, 1901.

Hysterotomy and dilatation of the cervical ring through the incision has no apparent advantages over the method just described, is less certain to succeed, and is more difficult and tedious. Abdominal section, dilatation of the cervical ring from above, and traction upon the fundus, has a high proportion of failures and mortality. Hysterectomy should scarcely ever be required. Pregnancy has followed the reduction of an inversion of eleven years' standing. The needless mutilation, therefore, of a woman of child-bearing age should be condemned. In the treatment of inversion caused by a polyp the tumor should first be removed by dissecting its base off the fundus uteri or by avulsion. The uterus should then be replaced by taxis, if possible, if not, one of the other plans of treatment described may be adopted. The tumor which has caused the inversion has not infrequently undergone some degree of gangrene; the wound left by its removal, therefore, should be cauterized with pure carbolic acid, and after reposition there should be for a week a daily irrigation of the uterine cavity with sterile water

Metritis.—An inflammation of the myometrium is called metritis; that of the endometrium, endometritis; that of the perimetrium, perimetritis. The present section deals, therefore, with an inflammation, acute or chronic, of the myometrium, although it must be understood that metritis and endometritis are inseparable, one perhaps antedating and causing the other, but both in time coexisting.

Acute Metritis.—An acute inflammation of the myometrium is most often the result of an infection of the endometrium and is most frequently seen after childbirth.[1] It may follow the introduction of instruments in the uterine cavity, especially if the technic is faulty in asepsis; operations upon the cervix; injuries to the uterine walls, exposure to cold, overexertion and coitus during menstruation, or it may occur in the course of infectious fevers, as the result of syphilis and phosphorus-poisoning, and in a gonococcus infection of the myometrium. The symptoms are great tenderness on pressure over the uterus, tympany, painful uterine cramps, fever, suppression of the menses or metrorrhagia, and possibly a profuse purulent uterine leukorrhea. On examination the cervix is soft and enlarged, as is the uterine body, and any movement or compression of the uterus in a bimanual examination is very painful.

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[1] Puerperal metritis is not considered in this work

The *treatment* is rest in bed, the ice-water coil or an ice-bag over the uterus, lukewarm vaginal douches twice daily, laxatives, and moderate doses of opiates or heroin for the pain. In the gonorrheal variety and in the inflammation following acute infectious endometritis, an intra-uterine douche, at least once a day, of permanganate of potassium solution (a dram of the saturated solution to the quart), is an essential part of the treatment. In the acute metritis occasionally seen with suppression of menses due to cold, a hot-water bag over the uterus should be substituted for the ice applications. After the acutest stage is passed, iodin over the hypogastrium and on the vaginal vaults hastens the cure. The prognosis is favorable except in puerperal cases and in very severe infections following operations upon or injuries to the uterus, which may demand hysterectomy. The disease may run a course of two to four weeks

Chronic Metritis is a common disease of women. It follows any condition imposing upon the uterus a long-continued and pronounced congestion, such as the injuries of childbirth, robbing the uterus of its normal support and leading to descent and malpositions, subinvolution; injuries to the cervix, retroversion; tumors in the uterus, or neighboring organs; a sluggish pelvic circulation from heart or liver disease; immoderate indulgence in sexual intercourse and methods to avoid conception, especially interrupted coitus, imprudence at the menstrual period in catching cold and overexertion; the constant working of a sewing machine and hard work of any kind continuously in the erect posture The result of the chronic congestion is a sclerosis of the myometrium, a great increase in the connective tissue between the muscle-bundles, a thickening of the arterial coats, and an enlargement of the lymph-spaces. The uterus is large, heavy, and unnaturally firm In the ultimate stage the uterine body becomes harder than cartilage; a heavy scissors, forced together with both hands, cuts through it with difficulty. If the chronic metritis is associated with or caused by subinvolution, there is a hyperplasia of muscular as well as of connective tissue.

The *symptoms* of metritis are a feeling of weight, drag, and bearing down in the pelvis, backache, irritable bladder, constipation, inability to be long on the feet, and a varied train of reflex nervous symptoms which may be produced by any of the pelvic diseases. There is almost always menorrhagia and usually a leukorrhea due to the endometritis that invariably accompanies metritis. There is often an aggravation of the symptoms with a blood-tinged mucous discharge midway between the menstrual periods (intermenstrual pain, "Mittelschmerz").

On a combined examination the increase in the size, weight, and firmness of the uterus is easily appreciated

The *treatment* must, if possible, be directed to the cause of the chronic congestion which is responsible for the metritis. There is therefore the utmost variety in the therapeutic measures required in individual cases. The injuries of labor in the lower birth-canal must be repaired; a malposition of the uterus should be corrected; the cervix may require trachelorrhaphy or amputation; tumors in the pelvis or abdomen may indicate an operation for their removal; a curettage is usually indicated for the chronic endometritis that accompanies the metritis; the sexual hygiene may demand correction; digitalis or strophanthus may prove the best remedies for metritis if there is valvular disease or weakness of the heart; a pill of stypticin (gr. j), hydrastinin (gr. ss), and ergotin (gr. j) t. i. d. is an excellent treatment for uncomplicated subinvolution; the patient's habits of life or work may need modification The congestion of the uterus may be temporarily diminished by glycerin tampons, hot-water vaginal douches, multiple punctures of the cervix (local bloodletting), rest in bed, and the assumption of the knee-chest posture twice a day for five minutes at a time.

It is claimed that chlorid of gold and minute doses of bichlorid of mercury bring about in time a resolution and absorption of the connective-tissue infiltration. If the disease has reached its ultimate stage of conversion of the uterine body into a mass of the firmest conceivable connective tissue, the disease is incurable. The author has been obliged to resort to hysterectomy in such cases for the uncontrollable metrorrhagia that was its most striking symptom and that had resisted repeated curetments, amputation of the cervix, and all the other conservative measures which are usually employed

Subinvolution.—An arrested or retarded involution of the uterus after childbirth or miscarriage may leave a large and heavy uterus after the completion of the puerperium, with a hyperplasia of both connective and muscular tissue The uterus is not only increased in weight and size, but is soft and flabby It is therefore particularly disposed to displacements downward and backward The symptoms of subinvolution are a sense of weight and bearing down, metrorrhagia, leukorrhea, inability to make much effort in the erect posture or to be long on the feet, and irritable bladder. On examination the increase in size and decrease in the tonicity of the womb are easily appreciated There are two causes of subinvolution that should always be looked for:

something attracting too much blood to the organ or some mechanical obstacle to firm uterine contraction. Under the first head examples are found in too early getting up after childbirth, premature resumption of sexual intercourse, inflammatory action in or around the uterus, obstructed pelvic circulation from heart or liver disease, or from abdominal growths, and tumors of the uterus, as fibroids. Under the second head are found such conditions as adhesions of the perimetrium to the parietal peritoneum or intestines and the retention *in utero* of portions of the ovum, overgrown decidua, and polypoid tumors.

The treatment should always be directed to the cause, if possible. On its removal the involution usually proceeds normally to its completion. The reduction of the uterus may be hastened by a pill of ergotin, stypticin, and hydrastinin, united with digitalis or strophanthus if the circulation is weak or obstructed, rest in bed, vaginal douches of hot water, and glycerin tampons.

Superinvolution and Atrophy.—If the process of puerperal involution proceeds too far and lasts too long, the uterus may be practically absorbed, except for a shrunken mass of connective tissue preserving its form in miniature. In extreme cases the uterus is reduced to the size of a peanut or the end joint of one's finger. The vaginal portion of the cervix disappears and the shrunken vaginal vault ends in the minute orifice of the external os. It is frequently possible to observe attenuation of the uterine walls by superinvolution without decrease in the length of the uterus. This condition, to some extent, is the rule in lactation (lactation atrophy) If a curettage is undertaken in a uterus of this kind, the danger of perforating the uterine wall must always be taken into account. Superinvolution often disappears after lactation, unless it has reached an extreme degree, when it is permanent. The symptoms are amenorrhea and sterility. On a bimanual examination the reduced size of the uterus is detected, and the attenuation of its walls is appreciable. The treatment should be general. Good hygiene, exercise, full diet, tonics containing iron, and a change of climate, best from the interior to the seashore, may give relief. The faradic current and the negative pole of a galvanic current to the uterine muscle have been beneficial Local treatment with the object of producing a pelvic congestion and stimulation is not as a rule to be recommended.

Atrophy of the uterus occurs physiologically after the menopause. It may also follow operations upon the cervix, salpingo-oophorectomy, inflammatory diseases of the appendages, pressure upon the uterus from a pelvic or abdominal tumor, adynamic or wasting diseases, exophthalmic goiter, and severe mental strain, hysteria, neurasthenia, and insanity. The symptoms are infrequent and scanty menstruation or amenorrhea and sterility. No treatment restores an atrophic uterus to a normal size and normal functions if the atrophy has advanced to a considerable degree. Occasionally the timely removal of the cause may be followed by an improvement in the local condition.

Injuries of the Uterus.—Aside from ruptures in childbirth and pregnancy, the uterus may be injured by instruments in an operation, as dilatation or curettage, in attempts to induce abortion, by falls upon some sharp object which enters the vagina, and by a brutal perversion of the sexual instinct. A branched dilator has perforated the posterior uterine wall not infrequently in an attempt to insert the instrument in an anteflexed uterus The author has seen in consultation a fatal injury of this kind from the Emmet curetment forceps. Perforation of the uterine wall by a curet is a comparatively common accident It has happened in the hands of every experienced operator several times, in spite of particular care to avoid it, but in an aseptic operation, if one avoids irrigation of the uterine cavity after the curet is felt to slip through the uterine wall and disappear up to the handle, there are absolutely no ill results. It is not necessary to open the abdomen on account of the uterine injury, but if the curetment precedes an abdominal section, the opportunity may be taken to close the small puncture wound through the peritoneum by a few interrupted catgut sutures

Fatal results have followed an intra-uterine injection after perforation of the uterine wall by a curet.[1]

If symptoms of infection and pelvic peritonitis follow a perforation of the uterus, a free opening of Douglas's pouch by posterior colpotomy, irrigation of the pelvis, and drainage afford the best chances of a cure. In case the uterus is necrotic from infection, it should be removed, if the patient's condition warrants the attempt, by vaginal or combined hysterectomy. The most dangerous injuries to the uterus are the result of unskilful attempts to induce abortion, usually by a criminal abortionist or by the patient herself. Perforations large enough to allow prolapse of the intestines into the uterine cavity have been made in this way A sound has been passed through the uterus, traversing the abdominal cavity and wounding the liver. The author has successfully operated upon a patient who pushed a buttonhook through the fundus uteri to induce abortion and in attempting to withdraw it caught and tore a hole in a loop of intestine Such injuries are usually fatal, but an abdominal section, with repair of the injury as far as possible, removal of hopelessly infected structures, and drainage by the vagina, the abdomen, or both, may save the patient.

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[1] In one of the large hospitals of Philadelphia recently a resident physician curetted a woman for an incomplete miscarriage, perforated the uterine wall with the curet, and then gave an intra-uterine douche of sublimate solution More than a pint of this solution was found in the pelvic cavity at the postmortem examination the following day.

A case is recorded in Germany of a drunken laborer who, after copulating with a woman, tore out her uterus with his hand.

Foreign bodies in the uterus are rare. Pieces of glass tubing have been broken off and pledgets of cotton have been left behind after an intra-uterine application. The author has seen the following cases: In one of the large German clinics a leech applied to the cervix entered the uterine cavity, whence it was dislodged with difficulty In two cases a tupelo tent, inserted to induce abortion, had slipped into the uterine cavity, was lying obliquely, and forcible attempts to extract it with a forceps had buried the lower end in cervical tissue, where it was firmly fixed. A knitting-needle inserted by the woman herself to induce abortion had not entered the cervical canal, but had penetrated the myometrium of the cervix and had passed up in the uterine wall almost to the fundus. Luckily for the woman, the needle had broken off before its point entered the abdominal cavity. By anesthetizing the patient, if necessary, it is usually easy to extract these foreign bodies by appropriate manipulations or with instruments, possibly after the dilatation of the cervical canal. Subsequently an intra-uterine irrigation and packing may be called for. It is said that a strong solution of table salt injected into the uterine cavity will make a living leech release its hold The custom of applying leeches to the cervix is, however, scarcely known in America

Hysteralgia, or neuralgia of the uterus, may be the expression of a uterine disease, malaria, or rheumatism. It may be idiopathic in nervous women or those much reduced in health and strength The pains are usually rhythmical, occurring about every ten minutes, often worse at night and in the supine position In one of the author's patients hysteralgia occurred regularly and very severely in alternate weeks. The seat of pain is in the uterine region, the sacrum, or radiates down the legs. It is often very severe, robbing the patient of rest at night, and in time wrecking her nervous system. Morphia relieves it most effectually, but the habit of taking this drug is easily acquired and it should be used most cautiously

The cause of the hysteralgia should be removed if it is symptomatic. The salicylates are effectual in the rheumatic variety Quinin and arsenic may cure it. The tonics and other treatment suitable to neuralgias elsewhere may succeed. Garrigues recommends highly the positive pole of a galvanic current in the vagina and uterus.

NEOPLASMS OF THE UTERUS.

Fibromyoma[1] of the uterus is a new-growth made up of the constituents of the uterine walls,—that is, mainly of unstriped muscle-fibers and connective tissue,—but containing also blood-vessels, lymphatics, and possibly nerves. Occasionally glandular structures are found in the tumor. A fibromyoma is the commonest neoplasm in the human body. It may be found in the uterus of at least 20 per cent. of women over thirty-five years of age These new-growths are classified in several ways: If the muscular tissue predominates, the tumor is a myoma; if the connective tissue predominates, a fibroma; if the two structures are well represented, as is usual, it is a fibromyoma, if there is glandular structure within the tumor, it is an adenomyoma. A myoma may be diffuse if it is incorporated intimately with the structure of the uterine wall and is not inclosed in a well-defined capsule. A fibroma is usually encapsulated or discrete. The most convenient classification, clinically, is based upon the relation of the tumor to the uterine wall, the endometrium, and the perimetrium. Thus a fibromyoma may be interstitial, submucous, or subperitoneal. The two latter varieties may have one of two forms, sessile or pedunculate. Another division, according to the situation of the tumor, is into corporeal and cervical fibromata. As subdivisions of the latter the tumor may be subperitoneal if it grows from the anterior or posterior wall, intraligamentary if it grows laterally, and a fibromyoma of the vaginal portion if it grows downward. It is a submucous and probably a fibro-adenomatous tumor if it grows into the cervical canal. Finally, there is a classification based upon the degenerative or pathological processes observed in fibromyomata; they may be edematous, fatty, amyloid, myxomatous, cystic, calcified, necrobiotic, necrotic, sarcomatous, cancerous, telangiectatic (vascular or lymphatic), and atrophic.

Pathological Anatomy and Histology.—A fibromyoma originally is interstitial and in its earliest stage is always a myoma, the predominance of fibrous tissue only appearing after the tumor has reached the size of a cherry. The histogenesis and etiology of the growth are as yet obscure. It has been claimed that the tumor originates in the muscular walls of an artery, the vessel forming a pedicle around and upon which the growth develops.

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[1] The synonyms of fibromyoma are leiomyoma, fibroma, myoma, fibroid, recurrent fibroid, hysteroma, *grossesse fibreuse*, *myoma laevecellulare*, fibrous tumor

A more generally accepted view is that the tumor develops from the muscle-fibers of the myometrium. The cause of the growth is as obscure as the origin of other tumors. There seems to be a connection between sterility and the formation of fibromyomata. It is indisputable that more fibromyomata are found in unmarried women of middle age, in women who have borne one or two children years before, than in married women who have married early and have borne a number of children. It has been asserted, therefore, that the uterine muscle, denied the opportunity of a physiological hypertrophy in repeated pregnancies, is prone to the pathological formation of musculofibrous tissue in consequence of such stimuli as coitus, masturbation, or ungratified sexual desire This theory, however, leaves unexplained the occasional occurrence of fibroids in young women and in women who conceive early and frequently It must be confessed that the etiology of fibromyomata is still among the unsolved problems of medical science. A fibromyoma is rarely single. As many as 150 tumors have been found in the uterus.[1] Often one tumor exceeds the other so much in bulk that the subordinate masses may easily be overlooked The tumor or tumors are as a rule discrete, surrounded by a capsule out of which they can easily be enucleated. Between the capsule and the tumor are the blood-vessels from which the latter is nourished. The blood-

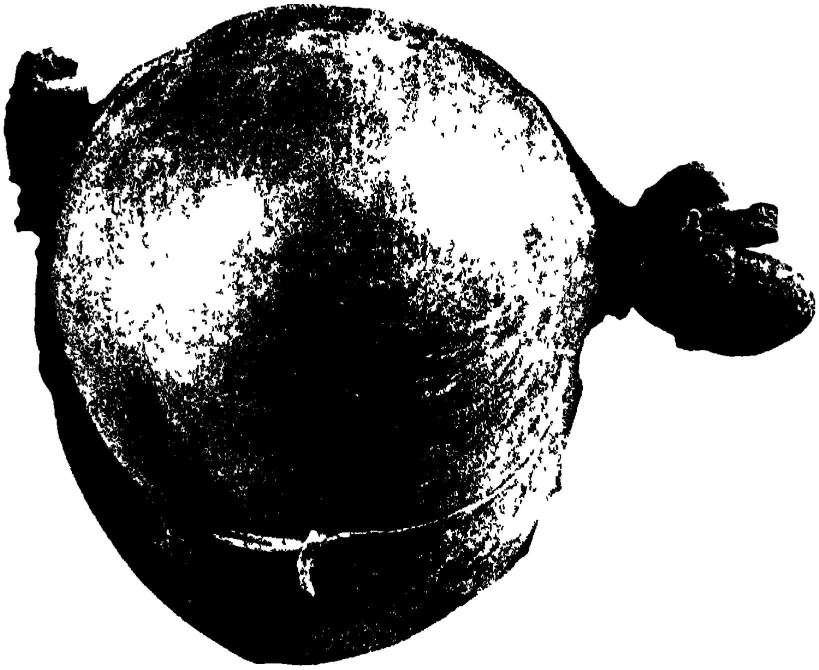

Fig 319 —Symmetrical enlargement of uterus by a fibromyoma

supply is scanty. Occasionally the growth is diffuse, unencapsulated, and blended with the myometrium. The latter form is more frequently seen in the lower portion of the uterus; it is a myoma rather than a fibroma and is vascular. The myometrium undergoes the same development in response to the stimulus of a growing fibromyoma that it does in pregnancy. There are the same rhomboidal arrangements of the hypertrophied muscle-bundles in the uterine wall that are seen in the gravid womb. A fibromyoma is subjected to pressure from the surrounding layers of uterine muscle which encapsulate it. If the growth begins approximately in the middle of the uterine wall, there is equal pressure upon the sides of the tumor and it remains interstitial, embedded in the uterine wall. Frequently there is an unequal pressure upon the growth so that a displacement occurs in the direction of least resistance, inward toward the uterine cavity until the growth is submucous with a half or more of its periphery covered by mucosa, outward toward the abdominal cavity until the growth is subperitoneal with the greater part of its periphery covered by perimetrium which tightly adheres to it, or laterally between the layers of the broad ligament. The form of the tumor is usually spherical. Different shapes may be assumed in consequence of pressure exerted upon the tumor by the uterus itself or by surrounding structures. An irregular lobulated form is common from the fact that two or three tumors

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[1] Bland Sutton, "Brit Med Jour," April 6, 1901

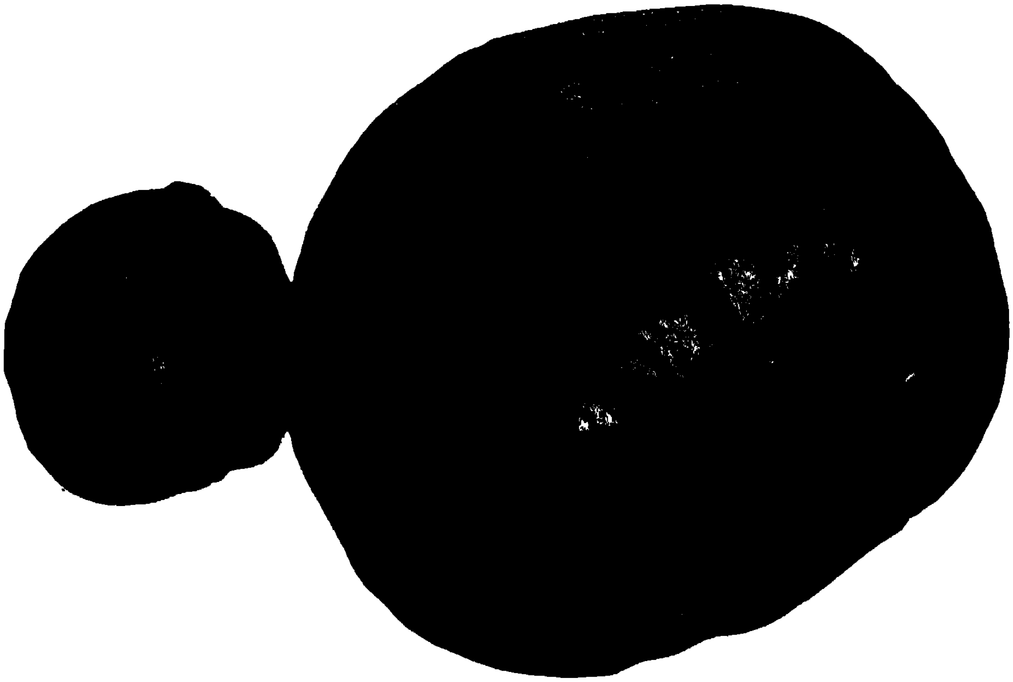

Fig. 320.—Symmetrical enlargement of uterus, with subperitoneal excrescence

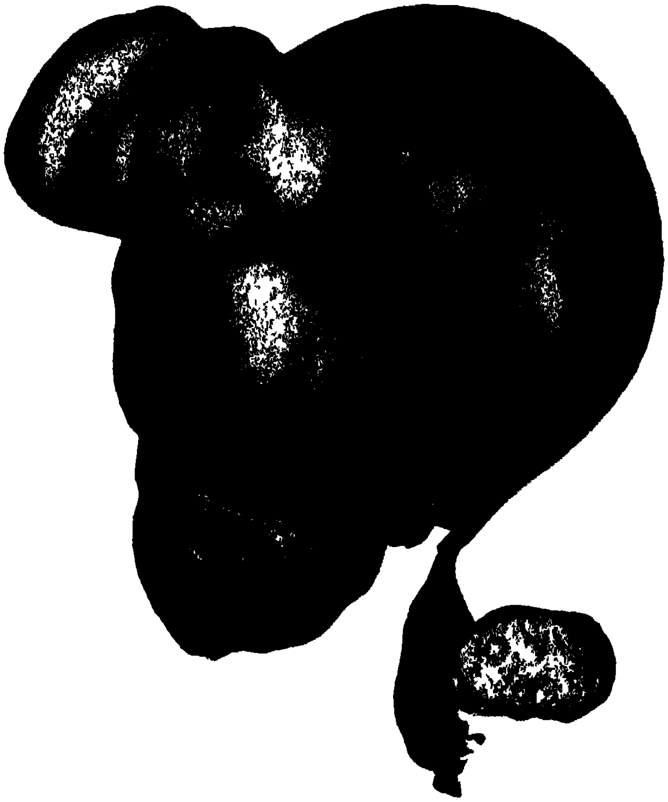

Fig. 321.—Fibromyoma with multiple subperitoneal bosses.

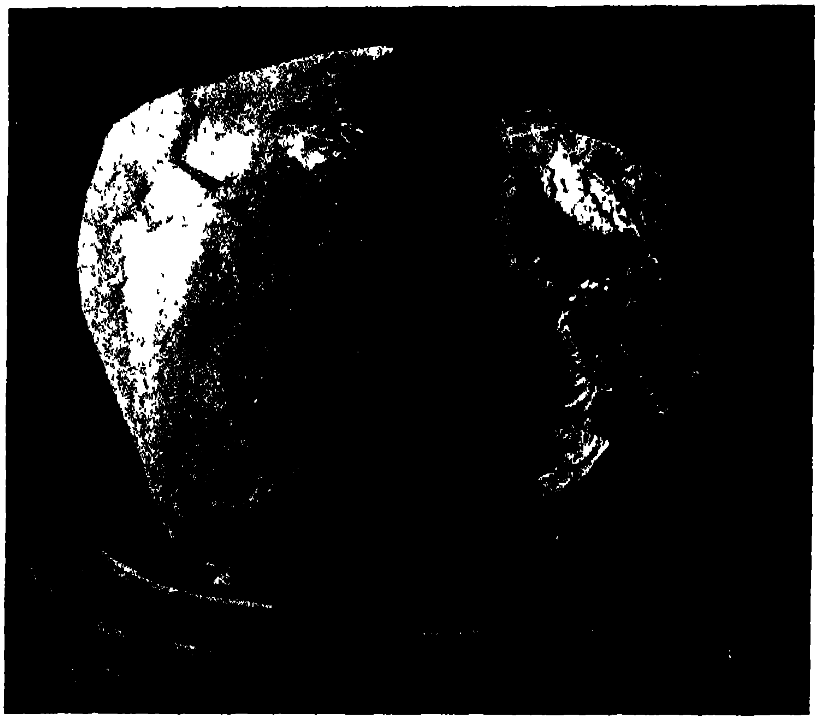

Fig. 322.—Large subperitoneal fibromyoma from posterior uterine wall (Porro-Cesarean section).

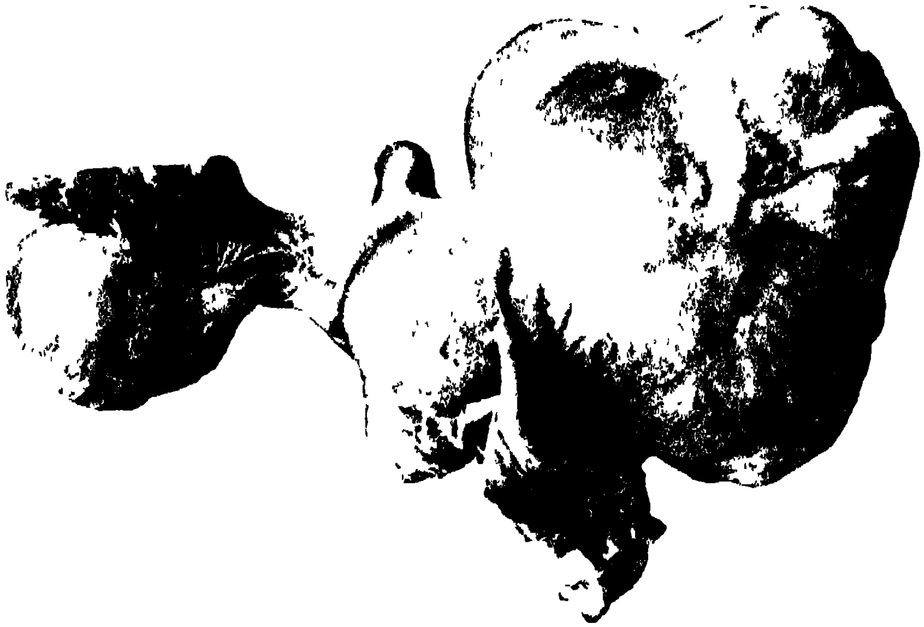

Fig. 323.—Large subperitoneal fibromyoma springing from right uterine cornu

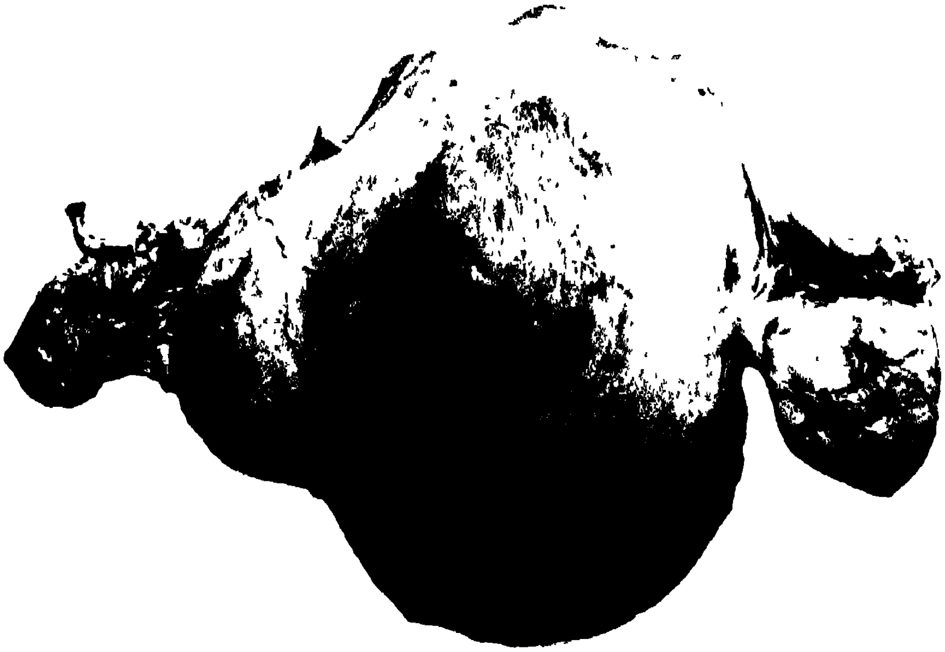

Fig. 324.—Fibromyoma of uterus, with intraligamentary growth on left side.

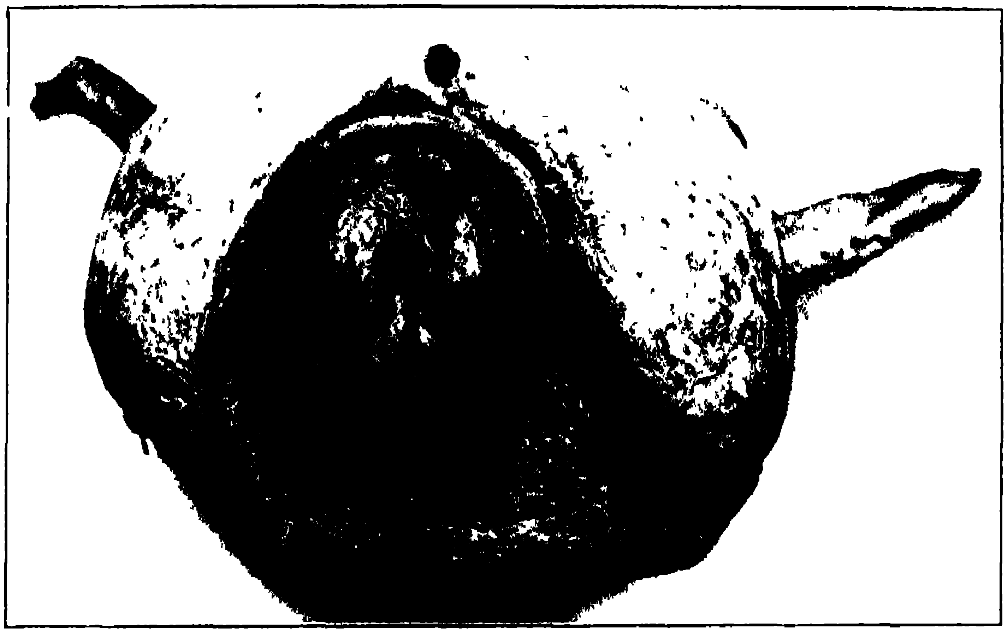

Fig 325 —Submucous fibroma removed by hysterectomy in the early puerperium.

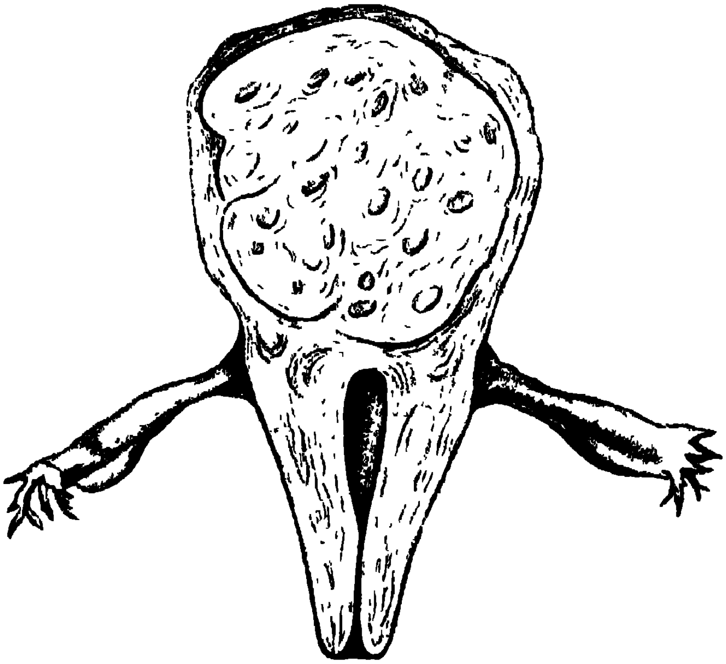

Fig 326 —Interstitial fibromyoma of fundus uteri (Olshausen).

may be grouped together, each in its own capsule, but forming a common mass. Submucous tumors may conform to the shape of the distended uterine cavity. The pressure to which they are subjected and the accessibility of the lower pole to microbic infection often determine a necrosis of the most dependent portion.

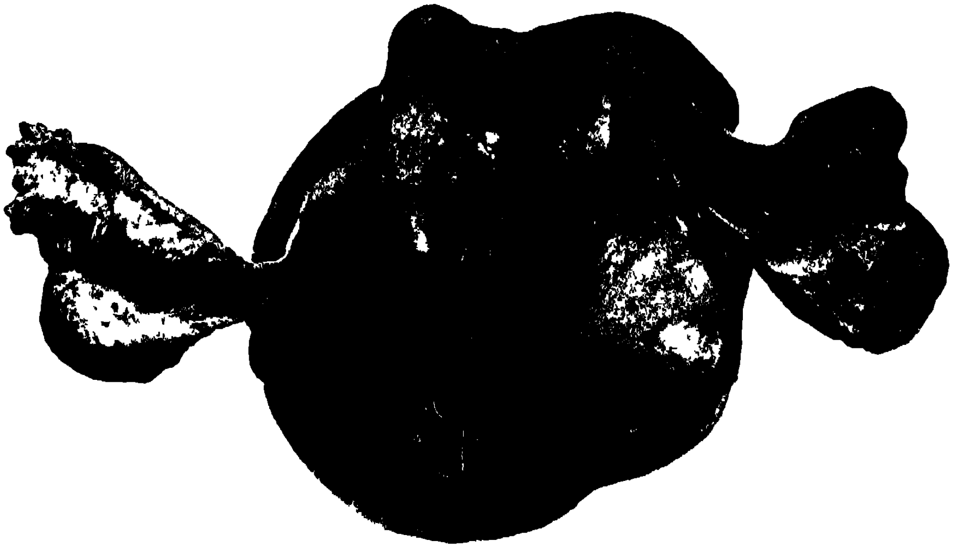

Fig. 327.—Fibromyoma of anterior uterine wall.

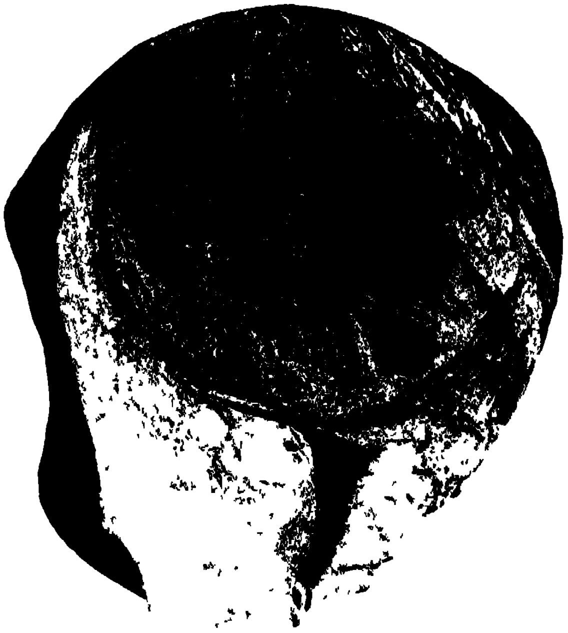

Fig. 328.—Uterine cavity deflected at right angles in interstitial fibromyoma of the fundus uteri.

The subperitoneal tumors frequently have a slender pedicle and are usually spherical in shape or else have the form of a potato with rounded projecting bosses. In the former case the tumor is often a soft myoma; in the latter, a hard fibroma. By a torsion of the pedicle the tumor may be severed from its connection with the uterus and remain free in the abdominal cavity or become attached to other structures. The uterus itself as a ped-

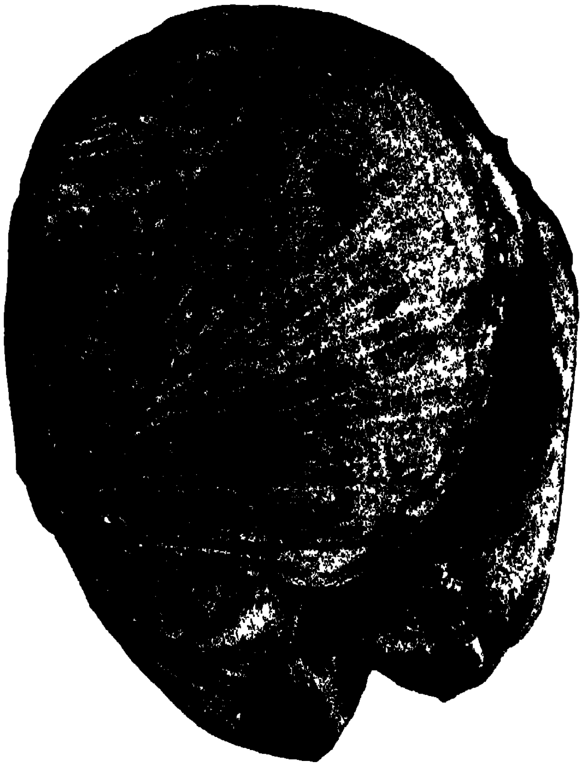

Fig. 329.—Uterine cavity in fibromyoma of posterior uterine wall.

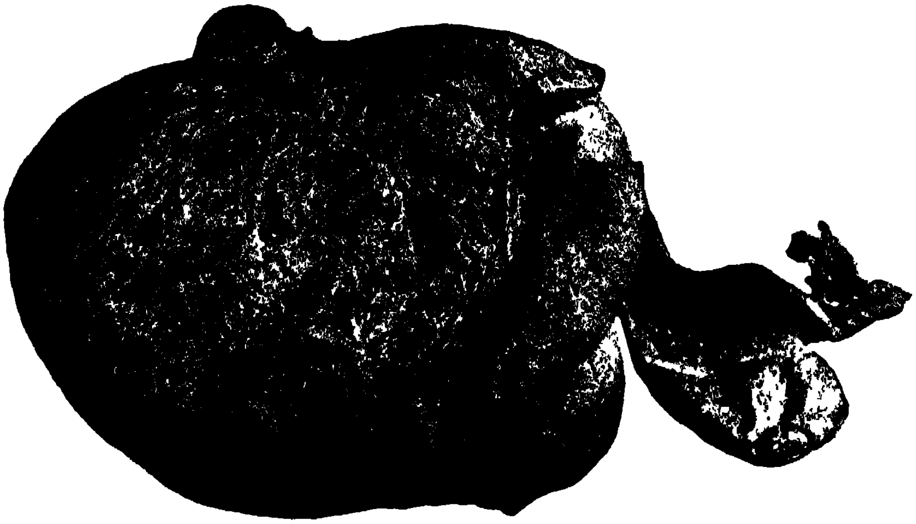

Fig. 330—Uterine cavity in fibromyoma of anterior uterine wall

icle of the tumor has been subjected to a twist of 120 degrees or more, and in one case (Lennander) the corpus was thus separated from the cervix. In interstitial and submucous tumors the uterine cavity is usually much lengthened and may be peculiarly distorted in shape and direction. It may be entirely obliterated In a case of Landau's serial transverse sections of the whole uterus failed to show a uterine cavity under the microscope. In a case of the author's (Fig 331) the uterine cavity could not be found macroscopically in serial sections

In a large proportion of cases (54 per cent., Tait) the uterine appendages are diseased There is salpingitis and ovaritis, the tubes are occluded and distended, often with pus. The ureters and the bladder are often displaced and compressed. One ureter may run over the top of an intraligamentary myoma and may be much thickened and enlarged. There may be a corresponding hydronephrosis. The bladder may be lifted surprisingly high into the abdominal cavity by a cervical myoma, reaching to the umbilicus in a condition of moderate distention. There may be such pressure upon the bladder and urethra that marked vesical irritability or even complete retention of urine results.

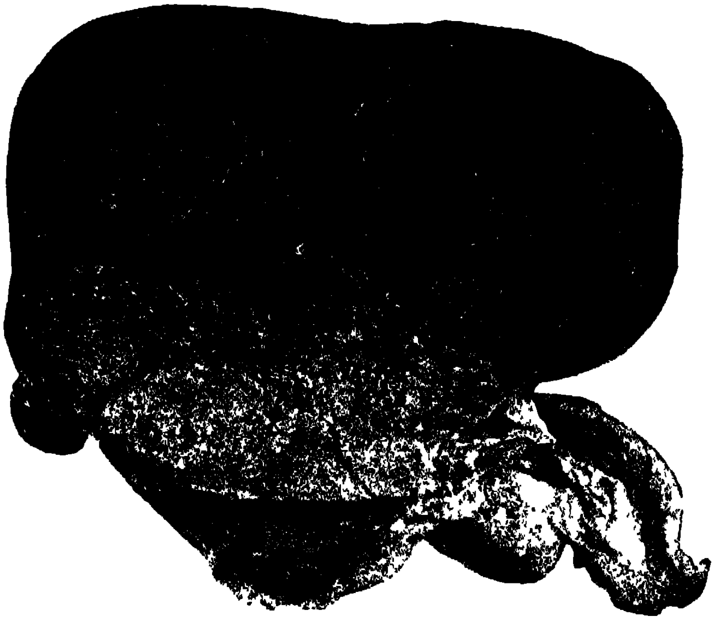

Fig 331 —Obliteration of the uterine cavity in a fibromyoma of the uterus

There is a curious relation between fibromyomata of considerable size and long growth and degenerative changes in the heart—fatty degeneration and brown atrophy of the cardiac muscle. Sudden deaths from this cause are not uncommon, especially after operation. Hofmeier collected 18 cases, and

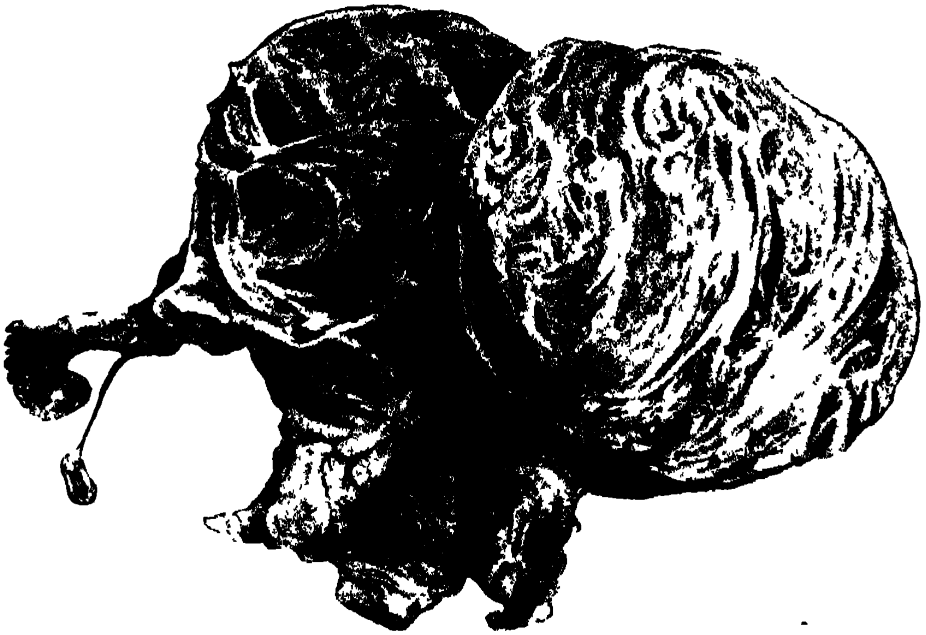

Fig 332.—Gross appearance of an interstitial fibromyoma on section

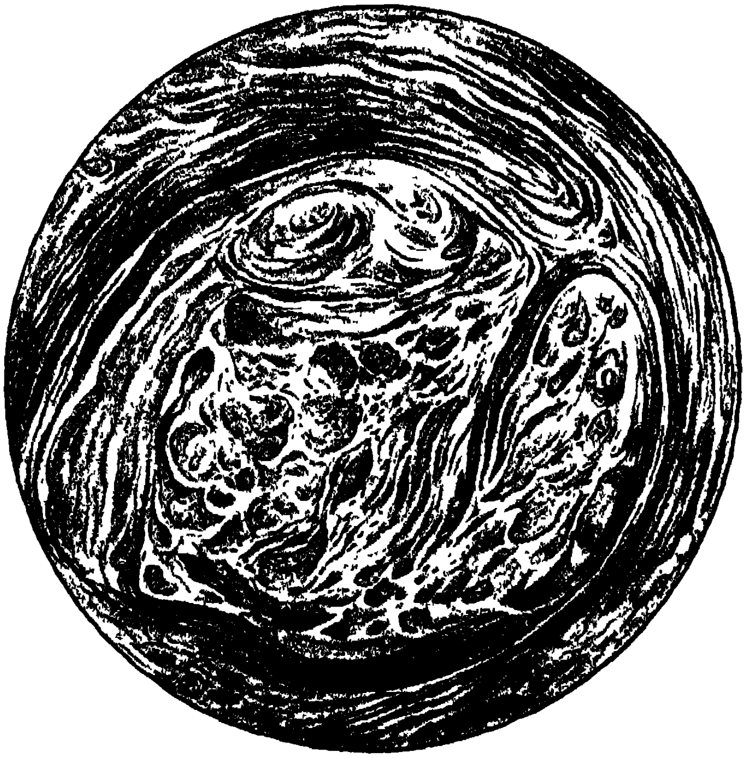

Fig 333.—Small interstitial myoma developed around an artery (Gebhard)

there is no surgeon of experience who has not had to deplore such a result, which it is occasionally impossible to predict or to prevent. Under a low-power magnifying glass the fibers of a fibromyoma appear to be arranged in whorls, aggregated to form nodes which are separated from one another by loose connective tissue in which are small blood-vessels. Under higher powers of the microscope it is impossible to demonstrate a regular order or arrangement of the muscle-bundles or cells or of the connective-tissue fibers. Gebhard calls attention to an interlacing arrangement which he has observed like the structure of a loofah-sponge.

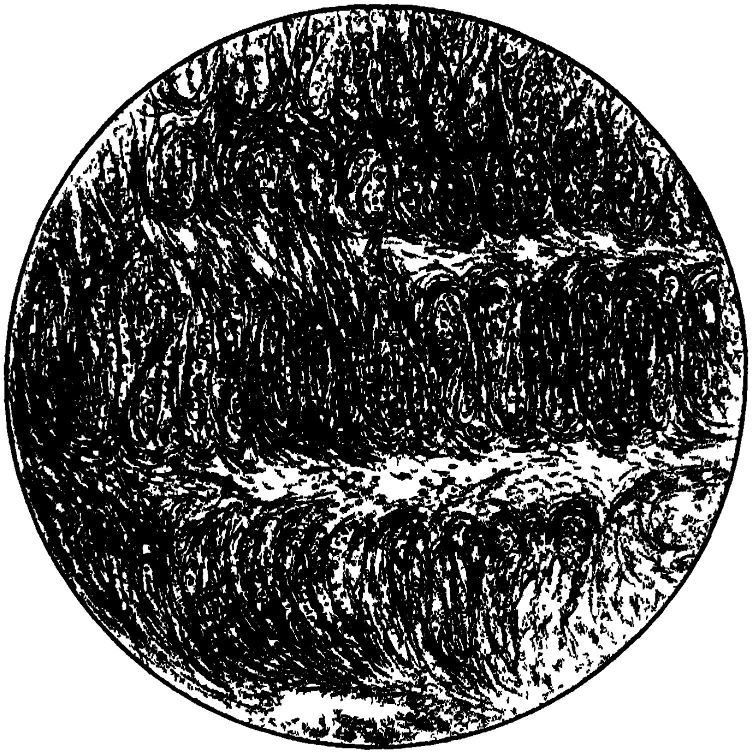

Fig. 334.—Loofah-sponge like structure of a myoma (Gebhard)

The individual muscle-cells measure in length 0 045–0 480 millimeter; they are spindle-shaped, with pointed and sometimes branched ends; the nuclei are rod- or spindle-shaped and stain well; the cell boundaries are indistinct. The connective-tissue fibers separating the muscle-bundles are composed of very long spindle-shaped cells, with nuclei and nucleoli. "Mastzellen" abound in many specimens. They are supposed to be metamorphosed connective tissue and muscle-cells. The arteries entering the nodes of a fibromyoma are said to lose or be without the adventitia, the cells of the muscular coat being in direct relation with the elements of the myoma; hence the theory that the myoma begins its development from the muscular coat of the arteries in the uterine wall and not from the myometrium proper. Hertz claims to have demonstrated the innervation of myomata,[1] but his observations are not confirmed. The most interesting and important result of the histological study of myomata has been the discovery of glandular structures in a small proportion. Schroeder and others pointed out this fact more than twenty years ago, attributing to the glands an origin from the endometrium. Ricker found five examples in thirty-five specimens of myomata examined, always in those under the

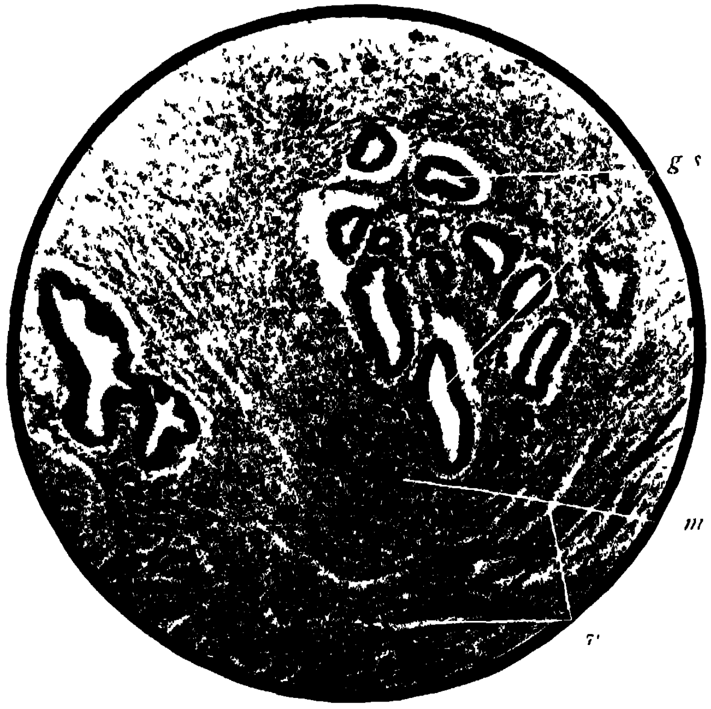

Fig. 335.—Adenomyoma of uterus: *g.s*, Gland-spaces lined with columnar epithelium; *m*, myometrium, circularly arranged around collection of glands; *v*, blood-vessels (McConnell and J. C. Hirst).

perimetrium, farthest away from the endometrium. In 1896 v. Recklinghausen[2] claimed that these glandular structures were derivatives either of the uterine mucosa or of the Wolffian bodies. In the former case the tumor is in the center of the anterior, posterior, or lateral uterine wall, or surrounds the uterine cavity like a ring; the continuity of the glands in the tumor with those of the mucosa is demonstrable. In the latter case the tumor is always in the posterior uterine wall or in the cornua. The main bulk of the tumor is interstitial, bulging into the abdominal cavity under the perimetrium; it is never encapsulated. It may present one of four forms: a hard tumor with muscular structure predominating; a cystic tumor, with numerous cavities plainly visible, a soft tumor with a predominance of glandular structures; a telangiectatic or angiomatous tumor with greatly dilated blood-vessels. The gland-spaces in these tumors have a peculiar arrangement: there is a main canal into which branch canals open one after another. The picture suggests a comb, the branch canals presenting the teeth, the main canal the back. From Cullen's investigations it would appear that the majority at least of adenomyomata are derived from the epithelial structures of Muller's ducts. The epithelium of adenomyomata may undergo cancerous degeneration, as one of Cullen's specimens demonstrates, whether there is a special tendency to such degeneration in these tumors is not yet clear.

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[1] "Virchow's Archiv," Bd. xlvi, p. 235.

[2] "Die Adenomyome u Cystadenome der Uterus u. Tubenwandung," Berlin, 1896.

The Degenerative or Pathological Changes in Fibromyomata.—*1 Edema.*—Thrombosis of the vessels in a fibromyoma is followed by edema. There may be no obstruction of the vessels, but sufficient pressure on the large pelvic trunks to cause an intense passive congestion It is difficult to differentiate colloid and myxomatous degeneration from edema. Specimens of the former have been described as edematous tumors. Meslay and Hyenne[1] describe three stages of edema. Simple imbibition of serum in a part of the tumor, separation of the muscle-bundles, formation of small spaces filled with a gelatinous fluid, the cavity walls not lined by endothelium, but by the fibromuscular bundles, coalescence of these spaces to form larger cysts. It is likely that the last two stages really represent myxomatous degenerations, though the authors quoted claim that the gelatinous fluid was chemically akin to blood-serum and contained no mucin, creatin, or creatinin. The remarkable variability in the bulk of a fibromyoma so frequently noted is doubtless due to a temporary edema and to the subsequent absorption of the serum It is a common observation that fibroids increase markedly in size prior to menstruation and decrease afterward.

2. Fatty degeneration is common in interstitial and submucous tumors. It is most frequently seen in the puerperium and may be the means of spontaneous cure by an involution of the tumor. The fat globules are found in the muscle-cells and in the "Mastzellen," giving to the tumor a characteristic appearance, a yellow mottled surface on section. A considerable portion of the fibromyoma may be converted into a lipoma

3. Amyloid degeneration is reported by Stratz[2] The tumor was a small submucous fibromyoma attached to the fundus. The connective tissue had undergone a degeneration which gave the amyloid reaction with iodin and methyl blue.

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[1] "Ann de Gyn," 1898, These de Paris, 1898

[2] "Zeitschr. f. Geburtsh. u Gyn," 1889, Bd. xvii.

4. Myxomatous degeneration is frequently seen in small portions of interstitial, submucous, and intraligamentary growths. The intercellular substance exhibits the degenerative process. The tumor on section looks like a mass of yellowish-green semisolid jelly with trabeculæ of firmer tissue running through it and masses of undegenerated fibromyomatous tissue here and there. Considerable areas may have liquefied into cyst-spaces containing a serous fluid. Microscopically cell-nuclei are found widely separated, and isolated masses of cells in scattered groups are seen. The main bulk of the section is made up of coagulated homogeneous intercellular substance with an indistinct network of fibers The arterial walls are usually affected by the degeneration, though unaltered blood-vessels may run through the tumor. Myxomatous degeneration is said to be most frequent in pregnancy. It is usually accompanied by a sudden and great enlargement of the tumor.

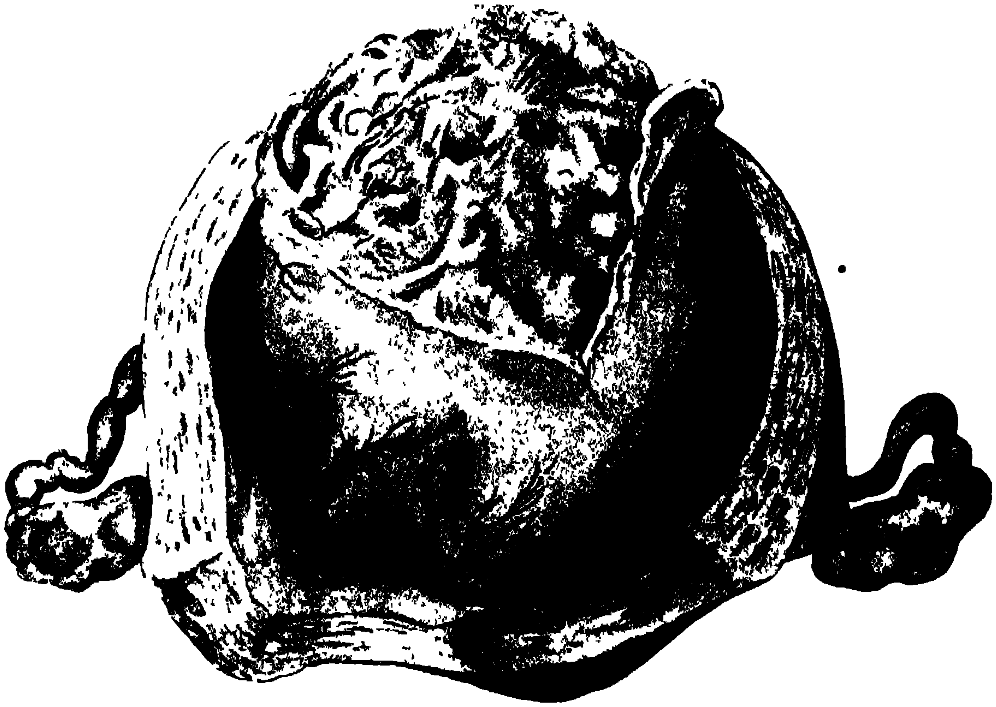

Fig 336 —Complete myxomatous degeneration of a large submucous myoma

5. Cystic degeneration of a fibromyoma is explained by a myxomatous degeneration, by edema, by the distention of gland-spaces in an adenomyoma, and by telangiectases of the blood- or lymph-vessels. The gland-spaces are recognized under the microscope by their epithelial lining. The dilated blood-vessels and blood-spaces contain large quantities of blood. The lymphangiectasis is recognized by the endothelial lining of the cyst cavities and the yellow coagulable fluid that they contain.

6. *Calcification* of a fibromyoma is an atrophic change. All further growth ceases and the tumor remains stationary in size. It is stony hard, in color like yellow ivory. The lime salts are mainly carbonates and phosphates The mass has a laminated structure and is brittle. By treatment with hydrochloric acid the fibrous and muscular tissue of which the tumor was originally composed may be demonstrated. Calcification may occur in submucous, interstitial, or subperitoneal growths. It has been asserted that bony and cartilaginous metamorphoses could be demonstrated in fibromyomata. There is always a suspicion that such growths were really calcified fibroids or "uterine stones." It is claimed, however, that Freund and Ascher have observed respectively an osteomyoma and a myochondroma.[1]

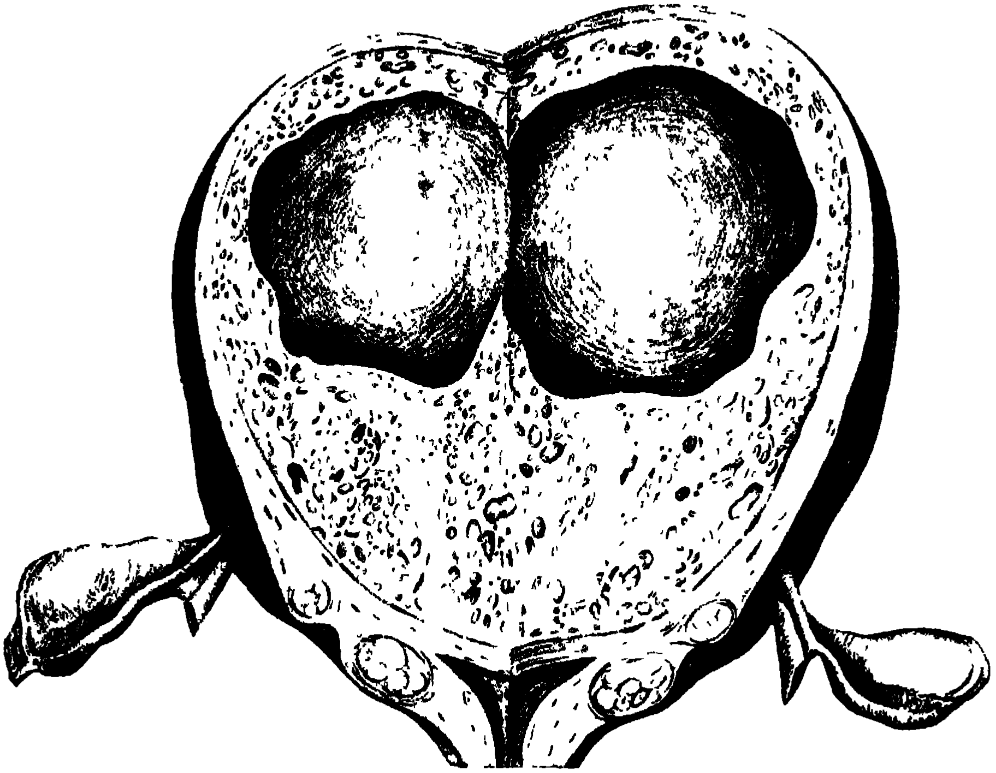

Fig. 337.—Telangiectatic interstitial myoma (Ruge)

7. *Necrobiosis* occurs if the nutrition of a fibromyoma is suddenly cut off, and if there is no infection of the dead tissue. The tissue softens, becomes reddish in color, undergoes fatty de-

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[1] Veit's "Handbuch," vol ii, p. 442.

generation, and liquefies. A toxemia may result if a large mass is affected by necrobiosis on account of the absorption of degenerated material into the lymphatics even though infection does not occur. Necrobiosis is usually seen in interstitial tumors. The contiguity of the intestines in subperitoneal growths and the exposure of submucous tumors to infection usually determines a necrosis if the blood-supply of such tumors is cut off. The necrobiosis begins in the center of the interstitial tumor which is furthest from the blood-vessels that enter it from the periphery.

8. Necrosis occurs if a fibromyoma is infected. The lower pole of a submucous fibroma springing from the fundus is very commonly the seat of inflammation and gangrene, as its nutrition is poor and its infection is likely. Any submucous tumor is liable to necrosis. It is rare in interstitial growths and not at all common in subperitoneal tumors, though the contiguity of the intestines and their contained micro-organisms always makes an infection possible, especially if adhesions form between the periphery of the myoma and the intestinal walls. The source of infection may also be a pyosalpinx. All of the fibromyomata are peculiarly liable to infection and necrosis after childbirth. The pressure to which they are subjected, the sudden disturbance of their blood-supply, and the susceptibility of a puerpera to infection of the blood-current and of the lymphatics make necro-

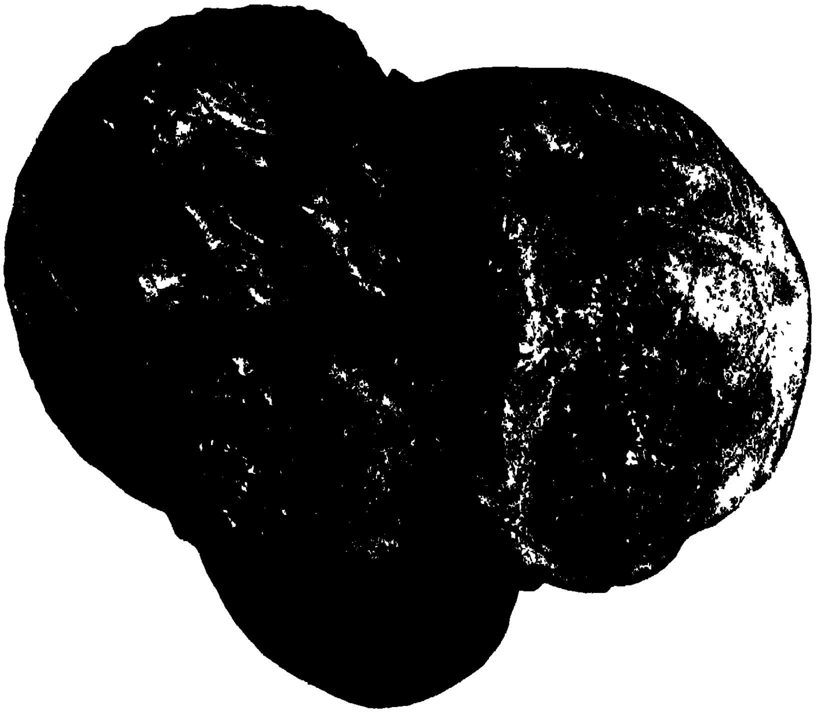

Fig 338 —Necrosis of an intraligamentary fibromyoma

sis of a fibroid in the puerperium probable. The author has operated on four such cases Necrosis has followed the electrical treatment of fibroids, the administration of ergot, curettage, and even the introduction of a uterine sound. A process allied to necrosis, but clinically different, is suppuration of the capsule without involvement of the tumor itself By this process the tumor may exhibit a spontaneous enucleation and be expelled from the woman's body Such an occurrence is more likely in submucous tumors, but Olshausen has seen two fibroids thus discharged through an abscess in the abdominal walls.

Necrosis of a fibromyoma, except in the puerperium and in polypoid submucous tumors, is rare Olshausen states that in many hundred fibroids under his observation he has never seen it. The author has had six cases, four in the puerperium, one in a submucous tumor that had caused complete inversion of the uterus, and one following electropuncture of the growth

9 Malignant Degenerations —Sarcomatous degeneration of a fibromyoma is not uncommon. It is accompanied by a sudden enlargement of the tumor, the disappearance of the fibrous tissue, and often a necrobiosis of the soft intracapsular mass There is a rapid extension of the disease to surrounding tissues and structures The unstriped muscle-cells are converted into spindle sarcoma cells A peculiar variety of sarcoma is the rhabdomyoma or tumor of striped muscle-fiber observed in cervical polyps. Carcinomatous degeneration is explained either by extension of an adenocarcinoma from the endometrium into the tumor or by carcinoma of the epithelium in an adenomyoma

10 Atrophy of a fibromyoma may occur after the menopause, in the involution of the puerperium, after castration, and in consequence of a diminished blood-supply by ligation of the arteries, or by some such means as partial torsion of the pedicle, pressure upon the vessels, or thrombosis It is usually a slow process The muscle-fibers shrink and undergo fatty degeneration, the fibrous tissue contracts like scar tissue, and in time a tumor of considerable size may completely disappear.

The Influence of Fibromyomata upon the Uterine Appendages and upon the Endometrium.—In almost all submucous and interstitial tumors there is a hyperplastic endometritis, the glandular or the interstitial structures predominating in individual specimens or being equally hypertrophied In rare instances the pressure of a large tumor upon the endometrium results in its atrophy. In subperitoneal tumors the endometrium may be unaffected. The tubes and ovaries are diseased in a large proportion of fibroids. There may be interstitial salpingitis and endosalpingitis with hemato-, hydro-, or pyo-salpinx. The ovaries are enlarged by an increase and enlargement of the follicles and an overgrowth of connective tissue. There is an increase in the number of corpora fibrosa, a hyaline degeneration of the vessels, and a premature disappearance of the primordial follicles (Gebhard).

Clinical History, Symptoms, and Diagnosis.—A fibroid tumor is usually first discovered in a woman after her thirty-fifth year, cases are recorded in young girls eighteen years of age and upward, but they are comparatively rare in women under thirty. The rate of growth is very slow, especially if the tumor is composed mainly of fibrous tissue Five, ten, and fifteen years may be required for the tumor to reach the size of an adult head, hence very large fibroid tumors are rare, for the menopause is reached and passed before they can attain great bulk. Cases are recorded, however, of tumors weighing 135 and 140 pounds If the growth is a myoma, the weight is surprisingly light compared with the bulk, as muscular tissue is not heavy. Figure 339 represents a case in which all the available room in the abdominal cavity was occupied by a myoma that weighed only twenty-three pounds. Ordinarily the growth of the tumor ceases at the menopause, but exceptional cases are recorded of a rapid growth after the cessation of menstruation. In such cases adhesions to the omentum furnish the main blood-supply to the tumor. Growth often ceases long before the menopause, perhaps in consequence of degenerative changes in the tumor, or without alteration in its structure. Every experienced specialist has observed cessation of growth and an unaltered size in the tumor over periods of ten years or more. The first symptom to attract attention is usually menorrhagia, in the shape of increased and prolonged menstruation, which produces in time a marked

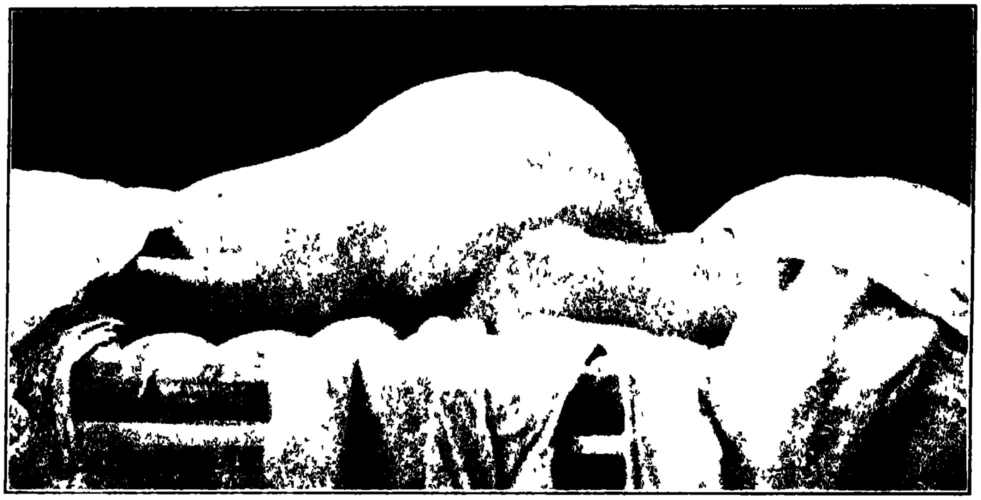

Fig 339 —Large fibromyoma, weighing only 23 pounds.

anemia.[1] In the intervals between the flow the patient regains some of her lost blood, but is again reduced by another hemorrhage The intervals between the periods are often gradually lessened until there is a continuous dribbling of blood, with exacerbations of hemorrhage at periods corresponding to the menstruation or at odd times. There may be, however, complete absence of discharge during the whole history of the case between the monthly periods. Exceptionally the menstrual flow may be unaltered, diminished, or altogether absent. The last condition is usually seen in subperitoneal or intraligamentary growths or in the rare cases of atrophy of the endometrium from pressure.

Leukorrhea often appears in the intermenstrual periods on account of the hypertrophic glandular endometritis. In rare cases the discharge becomes excessive In one instance a leukorrhea that soaked the woman's night-dress to the shoulders every night was really a lymphorrhea, enlarged lymphatic ducts being discovered after removal of the tumor, opening into the uterine cavity.

Pain is not often noted. There is usually not even discomfort from a tumor of considerable size, which is often discovered accidentally in a pelvic or abdominal examination, the woman herself being unconscious of its presence In subperitoneal pedunculated tumors pain may be caused by the "insults" to which neighboring abdominal structures are subjected by the movements of the tumor, and ascites may result, but the latter is a rare accompaniment of fibromyomata If the growth is incarcerated in the pelvis or is very large, distressing symptoms may appear in consequence of pressure on the sacrosciatic nerves, on the pelvic blood-vessels, the bladder, and rectum Neuralgic pains may dart down the legs, or there may be a loss of power; edema and varices of the lower limbs and of the abdomen may be noted; there may be obstinate constipation to complete obstruction of the bowels; the bladder may be irritable or there may be retention of urine Pressure on the ureters may obstruct the flow of urine and may ultimately produce hydronephrosis The diminution of resisting power in the urinary tract caused by pressure may determine its infection.

The degenerations of a fibroid tumor may be productive of special symptoms. Cystic degeneration is accompanied by rapid growth, with the symptoms that always accompany sudden distention of the abdomen—pain, orthopnea, and cardiac embarrassment Sarcomatous degeneration also occasions a marked increase in the size of the tumor, but even before the increased size is observed there may be a noticeable reduction in health and strength, an ill-defined feeling of discomfort or pain, and cachexia. Necrosis is accompanied by the general symptoms of sepsis and often of localized inflammation. If the tumor is submucous and necrotic, there is likely to be a foul discharge suggesting cervical or corporeal cancer and often leading to a mistaken diagnosis.

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[1] The menorrhagia is due to the hyperplastic endometritis and to the increased area of the endometrium.

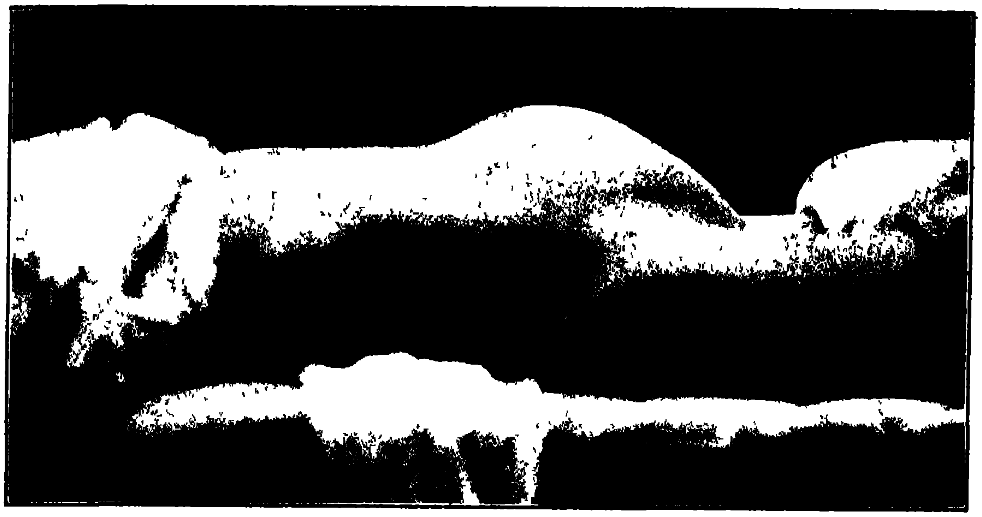

Fig. 340.—Fibroid tumor.

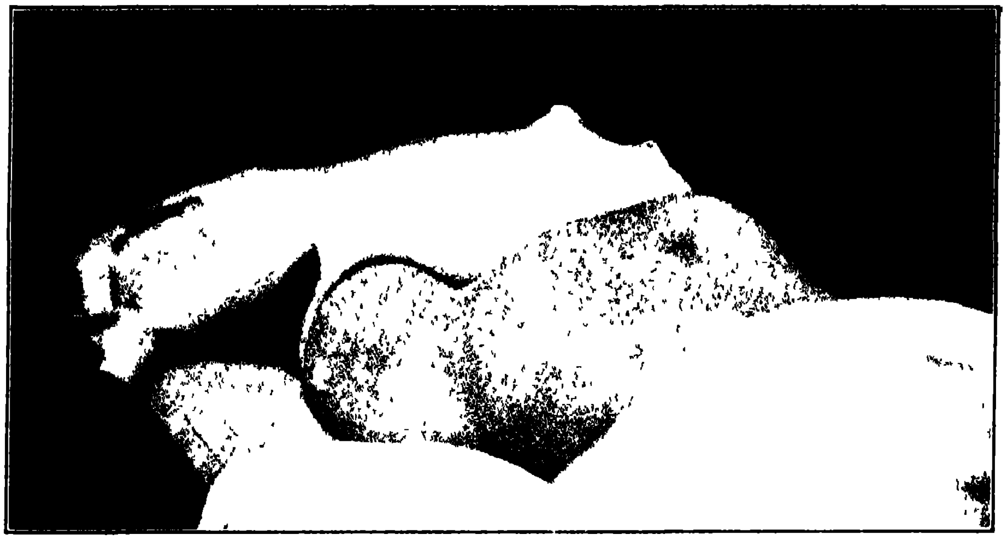

Fig 341.—Fibroid tumor.

Necrobiosis of a large tumor may occasion an autointoxication evidenced by malaise, headache, loss of appetite and weight, and coated tongue. Edema of a fibroid leads to variations of size in the tumor as the serum is exuded and again absorbed. It is a common experience to witness a regular increase in the size of a fibromyoma during the premenstrual congestion ; it has been asserted that by the amount of increase in size at this time one may predict the severity of the menorrhagia The sudden expansion of the tumor may be accompanied by pain, especially if there are inflammation and adhesions of the appendages

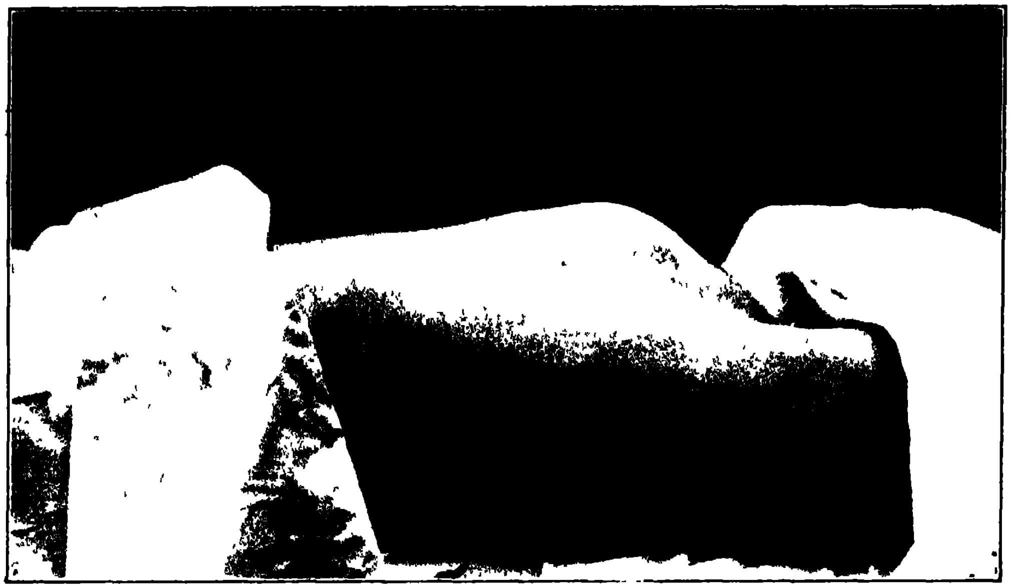
Fig. 342.—Fibroid tumor.

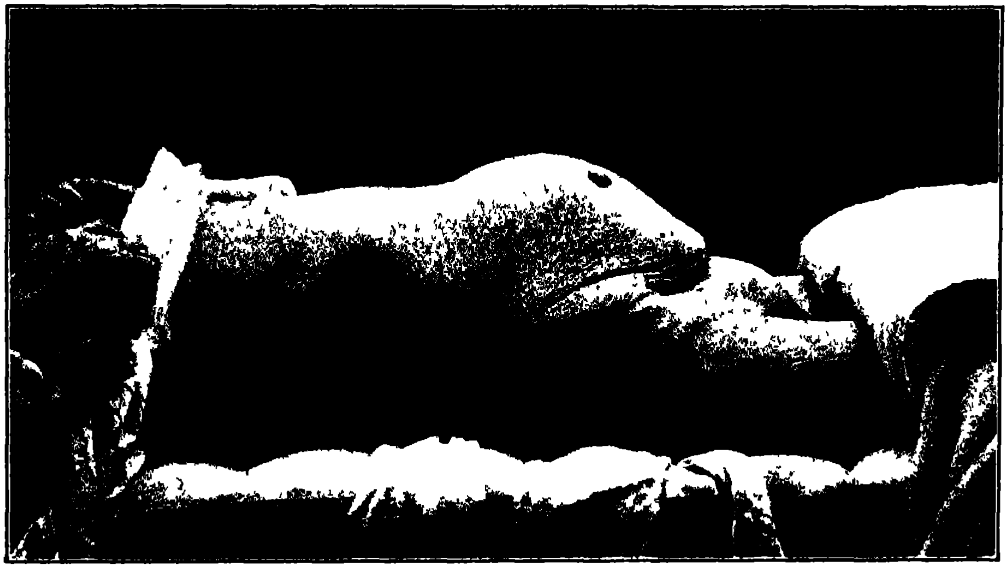
Fig. 343 —Intraligamentary cyst and fibroid tumor of the uterus.

The **diagnosis** of a fibromyoma is usually easy There are the subjective symptoms of hemorrhage and perhaps of an abdominal growth presented commonly by a middle-aged woman.

The objective symptoms are the enlargement of the uterus, its firm consistency and irregularity of outline, the bosses or knobs of a fibroid on the peritoneal surface being plainly appreciable as a rule in a combined examination. The objective symptoms, however, are not always plain and the diagnosis may be exceedingly difficult. If the tumor is regular in outline and soft in consistency, it may suggest strongly a pregnant uterus; but there is the history of slow growth and usually of menorrhagia. The author knows of a case in which a positive diagnosis of pregnancy and a coincident fibroid was made on account of the statement of the patient that there had been an amenorrhea of nine months' duration. A Cesarean section was attempted, but no fetus was found A submucous fibromyoma symmetrically distending the uterus may be difficult to differentiate from a pregnancy with detachment of the placenta. An intra-uterine exploration after dilatation of the cervical canal is the only means of arriving at a correct conclusion. A subperitoneal pedunculated fibroid with a slender pedicle, especially if it has become detached from the uterus, may be mistaken for a growth of some other abdominal organ It is usually possible to recognize the connection of the tumor with the uterus by having an assistant make traction upon it, if possible, through the abdominal wall upward toward the diaphragm, which makes the pedicle tense and so appreciable in a bimanual examination The commonest error in the differential diagnosis is to mistake some other growth for a fibroid. An old pus-tube with thick walls and firm adhesions is often regarded as a fibromyoma. Any solid tumor of the pelvis is almost invariably believed to be a fibroid until the abdomen is opened. Thus, fibromyomata of the broad ligament, fibromata of the ovary, and ovarian pregnancies have all been operated upon for fibroids of the uterus. The commonest and unfortunately the most serious mistake is to regard a pregnant uterus as a fibroid tumor. A patient was sent to the author from a distant State for hysterectomy on account of what was supposed to be a large fibroid. She was pregnant with twins. There was no fibroid. Time and again hysterectomies have been performed by operators of experience in cases of intra-uterine pregnancy without a trace of a fibromyomatous growth in the uterus.[1] There is a peculiar condition of the gravid womb in which such mistakes are difficult to avoid. There is a history of profuse, long-continued, and uninterrupted bleeding; there has been no amenorrhea, the uterus is the size of a six months' pregnancy; it is impossible, without exploration of the entire uterine cavity, to demonstrate the presence of an ovum in it, but in the upper portion of the cavity is a three or four months' ovum, retained for some time, causing hemorrhage from the time of impregnation and a continued bleeding after the death of the embryo. The uterus is distended far more by accumulated blood-clots than by the size of the ovum.

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[1] Five such operations of which the author has personal knowledge have been performed in the hospitals of Philadelphia within a few years.

A careful, methodical exploration of the uterine cavity should enable one to avoid such a mistake. In pregnancy there is always much more room in the cavity by the eccentric hypertrophy of the uterine walls than is ever found in a case of fibromyoma. The ovum should be discovered although deep exploration may be necessary to detect it. A submucous growth has a consistency very different from that of the ovum, and in almost all submucous as well as in interstitial tumors the intra-uterine cavity is irregular in shape and direction.

The Treatment of Fibromyomata of the Uterus.—Many cases require no treatment at all. If the woman has no discomfort; if the menorrhagia is moderate, does not exist, or the patient is past the menopause; if there is no further growth in the tumor and no evidence of pathological change in it, such as necrosis, cystic or sarcomatous degeneration, even palliative treatment is uncalled for and radical treatment is unjustifiable. The woman should be instructed to report to her physician every six months for an examination, and a series of notes should be kept showing the size of the tumor and the development of new symptoms, local or general. Every specialist of experience has under his observation for years cases which show no increase in the size of the tumor and no symptoms whatever except perhaps a moderate menorrhagia. In a certain proportion of these cases, especially after the menopause, there is a decrease in the size of the tumor, occasionally an almost complete disappearance. But patient and physician must often be reconciled to a postponement of the menopause beyond the usual period by ten or fifteen years. If in the course of repeated examinations, or when the patient first seeks advice, the uterine hemorrhages are a distinct disadvantage to her, palliative treatment at least is indicated.

Palliative Treatment.—The main object of this treatment is to diminish the hemorrhage. Incidentally the bulk of the tumor may be reduced, but such a result is not to be expected. Occasionally the incarceration of the tumor in the pelvis demands its elevation. The uterine hemorrhages may be lessened or entirely stopped by the exhibition of drugs, hygienic management, the application of electricity, curettage, intra-uterine applications, the removal of the ovaries and tubes, and the ligation of the arteries supplying the uterus.

Medicinal Treatment.—For a long time ergot by the mouth or ergotin hypodermatically was the routine treatment of the hemorrhages from a fibroid tumor. Little is heard of it now. The results achieved do not warrant the internal administration of ergot for months and years or the hypodermatic injections of ergotin twice a week for months at a time, that Hildebrandt advocated (1872) and that some years ago were universally practised all over the civilized world. The disadvantages of the treatment outweighed its occasional advantages. There is, however, one result to be hoped for in individual instances. A tumor becoming submucous by the contraction of the uterine muscle may be pushed out farther in less time into the uterine cavity by the prolonged use of ergot than it would have been without this stimulus to powerful uterine contractions and may so become more easily amenable to enucleation by way of the cervical canal. The author has had the best results in the medicinal treatment of the metrorrhagia of fibroids by a combination of ergotin (gr. j), stypticin (gr. j), and hydrastinin (gr ss) in pill four times a day, beginning, if possible, a week before the expected flow and continued while it lasts. When these remedies have failed, suprarenal extract has occasionally been successful. This animal extract gives better results than mammary or thyroid extract. But all medicinal treatment of the hemorrhages is uncertain and in a considerable proportion of cases quite futile.

Hygienic Treatment.—Everything that causes pelvic congestion should be avoided; constipation, coitus, working a sewing machine, prolonged effort on the feet, tight clothing, corsets, are, as far as possible, to be interdicted At the menstrual period the patient should stay in bed, at least for the first few days. The habit should be cultivated of lying down regularly once or twice a day for an hour or two, and the regular assumption of the knee-chest posture night and morning for five minutes at a time should be recommended The baths in Germany and England (Kreuznach, Schwalbach, Woodhall) that have been regarded as most beneficial for fibroid tumors do not aid the patient in the least, as far as the author's observation goes, except that change of air and scene and a well-regulated life may always be productive of improvement in the general health. The diet should be ordered with the idea of resupplying the blood lost at the periods. A full diet with plenty of soup and milk is indicated. Malt, iron, digitalis, and strychnia are usually called for between the periods.

The Electrical Treatment.—The enthusiasm at first aroused by Apostoli's method has completely died out. The unprejudiced gynecologist has lost faith in it either by personal experimentation or by observation,[1] and has learned, moreover, that it is by no means free from risk. Electropuncture of fibromyomata, the application of strong galvanic currents to reduce the bulk of the tumor, must be unreservedly condemned. One good, however, has come from a world-wide trial of the electrical treatment of fibroids. We have at our command in selected and suitable cases a valuable hemostatic agent in the positive pole of a galvanic current inserted in the uterine cavity. There should be a rheostat and a galvanometer to govern and to indicate the force of the current, which is most conveniently derived from the street current for lighting purposes. The positive wire is attached to a uterine sound, the end of which is of platinum, the handle being insulated. A movable insulating sheath is also provided on the sound. The negative wire is attached to a large pad, wet with salt water, to be placed upon the abdomen. The vagina is carefully cleansed. The instruments required are boiled. A bivalve speculum is inserted and the cervix is cleansed with pledgets of cotton soaked in a 1 : 1000 bichlorid solution; it is then seized with bullet forceps and pulled down; the uterine sound is inserted as far as it will go without force and the insulating sheath is pushed up to the cervix, to guard the vagina; the speculum is removed and the current is gradually turned on until the galvanometer registers 20 to 30 milliampères at the first treatment. In subsequent applications much stronger currents may be used; Apostoli says to 250 milliampères, but many do not employ more than from 55 to 60 milliampères. Forty milliampères is usually enough. The current should be maintained at its highest point for from four to ten minutes, and then should be gradually turned off The vagina is douched again and the patient rests absolutely a while after the treatment, remaining at home, after leaving the physician's office, till the following day. Two or three treatments a week are given; thirty treatments in all are usually required. The galvanic current applied in this way acts as a cauterant, destroying the superficies of the hypertrophied endometrium and forming an eschar. It is contraindicated by any degenerative process in the tumor and by inflammatory disease of the appendages.

Curettage.—If the uterine cavity is simply elongated and not distorted, if the tumor is not submucous, but interstitial, curettage may be of distinct service. Schroeder once observed necrosis of a submucous tumor, the capsule of which had probably been perforated by the curet with a consequent infection of the tumor.

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[1] The author was one of a committee of three appointed by the Philadelphia County Medical Society to investigate this treatment In three years' time not a single case was presented to us of a tumor reduced in size by electrical treatment.

Olshausen in an enormous experience has never seen an alarming symptom after the use of the curet, and it is probable that an aseptic operation is always perfectly safe in a suitable case. This has been the author's experience. In many cases the tortuous course and the inequalities of the uterine cavity make a curettage impossible, and it should never be undertaken without considering the possible risk of infecting a submucous tumor.

Intra-uterine Applications.—As a result of personal experience Veit[1] strongly recommends intra-uterine applications in tumors of moderate size in women near the menopause who suffer only from metrorrhagia, stating that he has often controlled the hemorrhage in this way for months at a time. He uses laminaria tents soaked for some time in a 95 per cent. solution of carbolic acid in alcohol to dilate the cervix; the uterine cavity is explored with the finger; if the tumor is submucous, it is enucleated; if not, a considerable quantity of iodin or solution of chlorid of iron is injected with a Braun's intra-uterine syringe. The former is not so efficient, but does not cause uterine colic; the latter does, often violently. The author has no experience with this treatment and would hesitate to use it, preferring as a palliative measure the galvanic current or the curet.

Salpingo-oöphorectomy—Since Trenholme and Hegar performed the first operations of castration, in 1876, to check the hemorrhage from fibroid tumors, the number recorded has been sufficiently large to permit the formulation of definite rules and statements as to indications, limitations, and results Castration may be expected to accomplish satisfactory results in checking hemorrhage and effecting a reduction in the size of the tumor in 75 to 90 per cent. of suitable cases It is not to be depended upon except in interstitial tumors of moderate size. It is contra-indicated by cystic degeneration. The operation is by no means as easy or as safe as castration under ordinary circumstances. The uterus is ordinarily turned on its long axis so that the right ovary is posterior to the tumor and inaccessible. The ovaries are not infrequently embedded in adhesions or are spread out on the surface of the tumor. The large blood-vessels in the broad ligaments are easily injured and fatal hemorrhage has occurred from puncture wounds of the pedicle needle. Infection, also, is more likely than in other operations upon the broad ligaments. Every scrap of ovarian tissue must be removed if the operation is to be a success, which is occasionally impracticable. In 10 to 15 per cent. of cases continued hemorrhage or steady growth of the tumor necessitates later a myomectomy, an enucleation of a submucous tumor, or a hysterectomy. In view of these disadvantages and of the limitation of the operation to moderate-sized interstitial growths, it is not regarded with favor by the majority of operators. It has, however, its place, and should not be forgotten in a case, say, of weak heart, in which on opening the abdomen conditions are found favorable for it.

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[1] "Handbuch der Gynäkologie."

Ligation of Arteries Supplying the Uterus.—Ligation of the ovarian artery to diminish the blood-supply to a fibroid tumor was proposed and carried out by von Antal and by Schroeder more than twenty years ago. Rydyzier[1] in 1889 ligated the six arteries supplying the uterus, with temporary success, but bleeding returned later to such a degree that the patient died of anemia. Lately the operation has been revived with considerable enthusiasm. The usual method and the one to be recommended is the opening of the anterior vaginal vault and the separation of the bladder from the uterus, the opening, also, of the posterior vaginal vault, and the ligation of the vessels in the broad ligament, the uterine artery being isolated and tied on both sides. If easily practicable by the vaginal route, it is much easier to tie, next the artery of the round ligament, and finally the ovarian artery, the pedicle needle having a short, sharp curve and being inserted from and emerging again upon the anterior surface of the broad ligament, the forefinger of the left hand inserted through the opening in Douglas's pouch guarding and directing the needle-point. An abdominal section may be necessary to tie the upper arteries of the broad ligament. The operation is only suitable for tumors of moderate size, interstitial in situation, that have undergone no degenerative process. The field for it is very limited. The author's experience with it has been disappointing.

The Radical Treatment of Fibromyomata.—*Removal of Myomatous Polyps.*—If the tumor is moderate in size with a slender pedicle it may be seized with a volsella forceps and twisted off by rotary movement of the instrument on its long axis. If the pedicle is too thick to be treated in this manner, the safest plan is to make with scissors or a knife a circular incision around its base and to enucleate the pedicle. If the latter is inaccessible, it may be necessary to slip the noose of a wire écraseur around it and to cut it off by tightening the wire. There is, however, always danger in this method of partially inverting the uterine wall and of removing a portion of it, possibly making an orifice into the peritoneal cavity. The cervical canal ordinarily gapes widely enough to permit easy access to a myomatous polyp. If it does not, one of the methods of artificially dilating it may be required.

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[1] "Wien. klin Wochenschr.," 1890, No. 10; "Centralbl. f. Gyn.," 1893, No. 33

namely, branched dilators, bougies, incisions, or laminaria tents soaked for some time in a 95 per cent. solution of carbolic acid in alcohol.

The Enucleation of Submucous Tumors.—A submucous tumor of considerable size may be removed by the vagina. Veit claims that any tumor which can be pressed into the pelvic canal from above may be removed in this manner. The usual limitation of size is that of the fetal head. A preparatory wide dilatation of the cervical canal is necessary. Laminaria tents prepared in the manner already described are a convenient means of obtaining the dilatation. They are inserted the night before the operation.

It is always necessary to be prepared to widen the cervical canal by separating the cervix from the anterior vaginal vault, dissecting off the bladder and making an incision through the whole length of the cervix in the median line anteriorly. The tumor being rendered easily accessible in this manner, the finger-tip is pushed through the friable mucous capsule at the most prominent accessible portion and the capsule is stripped off sufficiently far to grasp the tumor itself with tenaculum forceps Traction on the tumor and a further stripping back of the capsule make it possible to free the tumor and to deliver it, often with surprising ease

Abdominal Hysterectomy.—Successive improvements in the technic of this operation, due to Schroeder, Chrobak, Baer, and others, have made it the most satisfactory of all the operations for fibroid tumors. It is adapted to tumors of any shape, size, or position, but it involves a mutilation of the patient which should be avoided if it is easily possible to remove the tumor alone and to leave the uterus in good condition. Hence it is usually restricted to large interstitial growths, to submucous tumors too large to remove by the pelvic route, to subperitoneal tumors with too large a pedicle to ligate safely, or with too deep a bed after enucleation to be managed successfully, to intraligamentary growths that can not readily be removed separately, and to tumors that have undergone degeneration

The technic of the operation may be thus described: An abdominal incision is made long enough to permit the delivery of the tumor from the abdominal cavity Adhesions, if they exist, are carefully severed, perfect hemostasis being secured. The tumor is seized by the fingers hooked under its upper margin and is delivered through the abdominal wound The patient is raised in the Trendelenburg position. The intestines are covered with a large pad. An assistant retracts one side of the abdominal wall with a retractor. A ligature of silk or catgut on a pedicle needle secures the ovarian artery on this side; another, tied over the first, the artery of the round ligament. A hemostat is fastened to the outer edge of the broad ligament over these ligatures. A clamp is fastened to the whole width of the broad ligament above the hemostat, far enough away to enable the operator to cut conveniently between the two instruments. Before closing the clamp its points are pressed firmly against the tumor so that they shall secure all the blood-vessels. The broad ligament is then cut between the hemostat and the clamp to the periphery of the tumor or to the wall of the uterus. The ascending branch of the uterine artery is cut at this point. Before it is cut or directly afterward it is seized with a hemostat The same procedure is carried out on the opposite side. A knife is then drawn across the anterior face of the uterus at a height which insures the bladder against injury, joining the incisions in the broad ligaments and going deep enough to cut through the capsule of the tumor if it is situated in this region or to furnish a flap of peritoneum with some underlying muscular tissue. A similar incision is made posteriorly, the uterus, held at the fundus by heavy volsella forceps, being pulled backward for the anterior and forward for the posterior incision. The uterus is now held

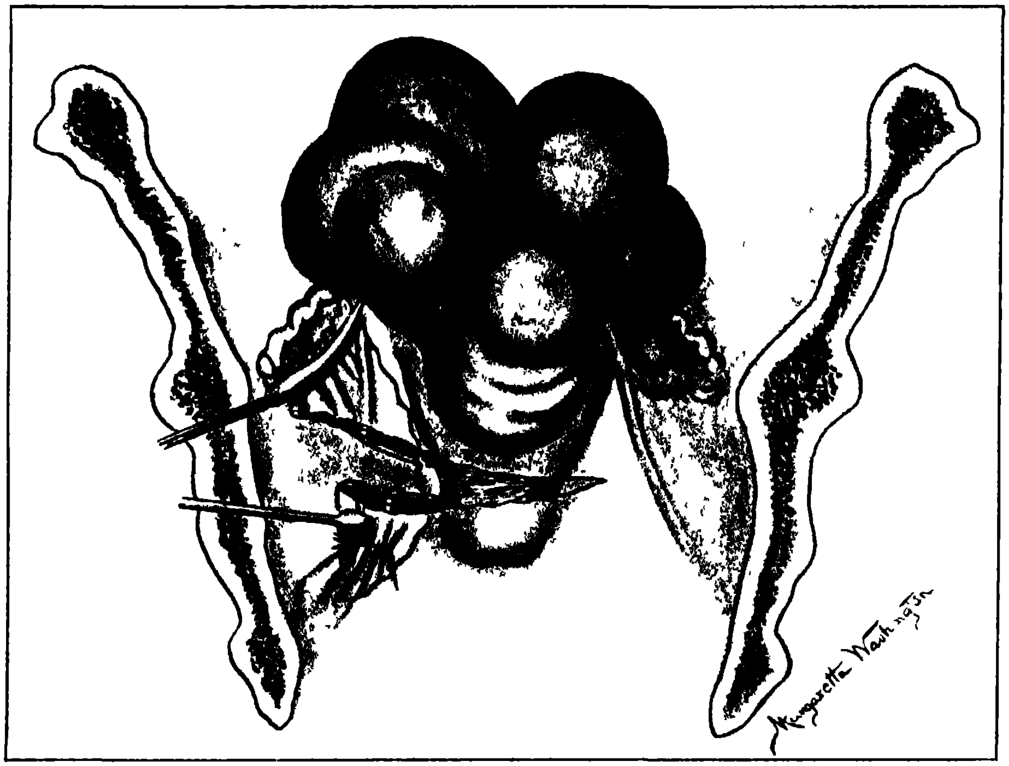

Fig. 344.—Ligation of the ovarian artery and the artery of the round ligament; division of the broad ligament between clamps

only by the cervix. Before amputating it at the level of the internal os, the uterine arteries are tied by plunging sharp-pointed pedicle needles with different angles through the bases and between the layers of the broad ligaments, under the arteries, and near enough to the cervix to insure the ureters from inclusion in the ligatures. On the side nearest the operator the thumb and forefinger should catch the artery about half an inch from the cervix and the pedicle needle should be inserted between the fingers and the cervix, the point of the needle being inclined away from the operator. The same is done on the other side, except that the point of the needle is inclined toward the operator. The cervix is now cut across with heavy scissors and the uterus is removed. The cervical walls are joined with a few interrupted sutures if there is much oozing. A continuous suture beginning on the operator's side tucks in the stumps of the ovarian arteries and the round ligaments, closes the upper edges of the broad ligaments and the peritoneal flaps over the cervix. The abdominal cavity is carefully cleansed and dried and the abdomen is closed. Two modifications of this technic are occasionally indicated: one, the removal of the entire uterus with the cervix—panhysterectomy; the other, the ligation of one broad ligament, its transverse section, the ligation of the uterine artery, the ligation of the ovarian artery and that of the round ligament on the other side; then the section of the cervix, the division of the uterine artery on the opposite side, its ligation, and the separation of the broad ligament from below upward.

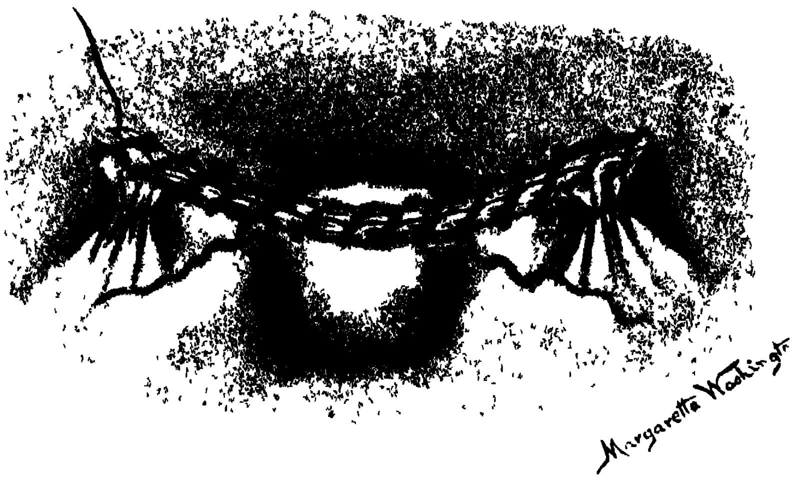

Fig. 345—Closure of peritoneum over the stump after hysterectomy by supravaginal amputation of the uterus.

Panhysterectomy is indicated if there is malignant disease of the uterus, infection of the tumor or of the uterus, or if it is desired to drain the pelvis by way of the vagina. In general, supravaginal amputation of the uterus is to be preferred as a quicker, easier operation, with less risk of injury to the ureters, and leaving a more natural condition of the vaginal vault.

The technic of panhysterectomy differs from that of supravaginal amputation only in the complete separation of the cervix from the vaginal vault. This is most conveniently effected if the woman has borne children and the vagina is capacious, by beginning the operation by the vagina, making a circular incision around the vaginal portion of the cervix, opening the anterior and posterior cul-de-sac, and detaching the cervix laterally as far as the cervicovaginal branch of the uterine artery. The vagina is then packed with gauze, the rubber gloves are changed, the abdomen is opened, and the broad ligaments are severed as already described After the ligation of the uterine arteries it is only necessary to join the incisions opening the anterior and posterior peritoneal reduplications with the incisions in the broad ligaments and to cut the parametrium on either side of the cervix to the median or inner side of the ligated blood-vessels The uterus is then lifted out entire The vaginal walls may be joined by two or three interrupted catgut sutures running anteroposteriorly or may be left open for drainage The edges of the broad ligaments and the flaps of peritoneum attached in front to the bladder and behind to the rectum are joined by a running stitch of catgut After the abdomen is closed the packing is removed from the vagina, as it is soaked with blood, and is replaced by fresh sterile gauze. If the operation is not begun by the vagina, the vaginal vault may be opened from above, laterally, posteriorly, or anteriorly, as the operator prefers, the usual custom being to introduce an instrument into the vagina, such as a closed Emmet curetment forceps, and to cut down upon it as a guide while an assistant presses it firmly upward. The author's habit, however, has been to dissect the cervix from the bladder from above until the dissection reaches a point below the tip of the vaginal portion which is plainly felt through the vaginal wall; then, by cutting directly backward through the anterior vaginal wall in the median line, the vagina is opened. It is then easy to cut the vaginal vault and the parametrium around the cervix after the ligation of the six arteries of the broad ligaments.

The separation of the uterus by severing first the broad ligament from above downward, then amputating the cervix or detaching it from the vaginal vault and severing the opposite uterine artery and broad ligament from below upward, is indicated in intraligamentary fibroids. The broad ligament on the unaffected side is ligated and separated in the usual manner; the ovarian artery and that of the round ligament are ligated on the opposite side; the cervix is cut across, the uterine artery is clamped and cut, and the intraligamentary growth is rolled out of its bed in the broad ligament from below upward. The ureter occasionally runs over such a tumor; by this manœuver it slips outward away from the tumor, drops into the bed left by the tumor, and thus escapes injury. The large raw space left between the layers of the broad ligament should be drained If the cervical canal gapes, a supravaginal amputation permits of sufficient drainage by a strip of gauze pushed through it into the vagina, the peritoneum being closed over the cervix, as usual, by a continuous suture; if sufficient drainage can not be secured by way of the cervical canal, a panhysterectomy is indicated, the vaginal vault being left open and packed with gauze, but the peritoneal flaps being united above to close the abdominal cavity

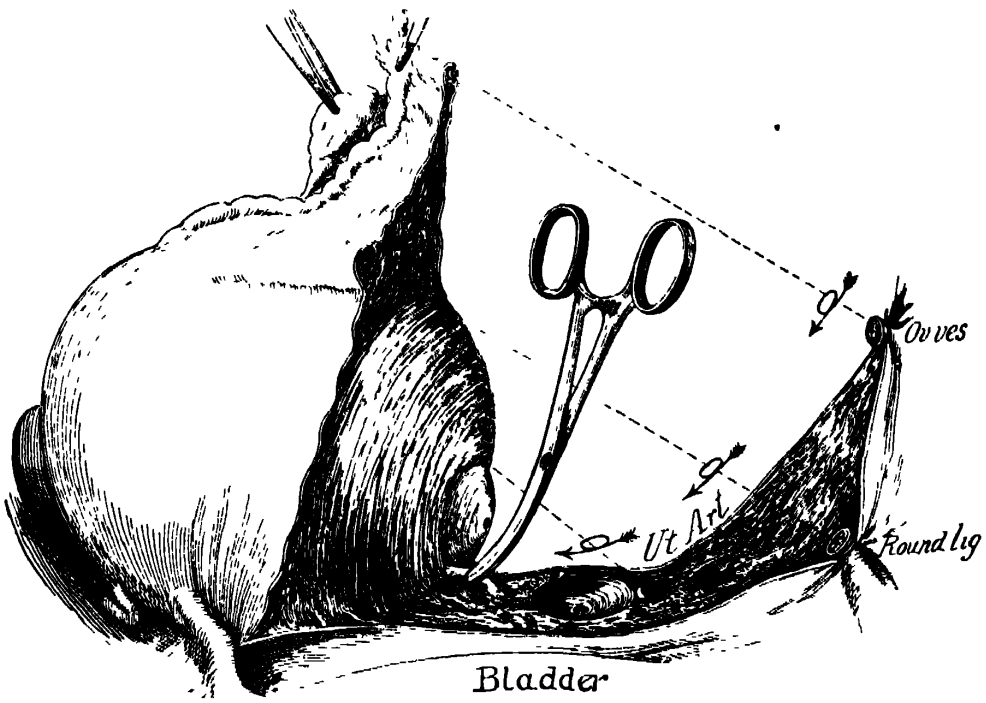

Fig 346 —Left ovarian vessels tied, vesical peritoneum divided and pushed down, and left uterine vessels ligated Cervix amputated and uterus pulled up and out, exposing right uterine artery, which is clamped an inch above the cervical stump The two following steps are clamping the right round ligament and right ovarian vessels, when the mass is removed (Kelly).

The Enucleation of a Fibromyoma by Abdominal Section.[1]—In a study of specimens removed by hysterectomy it not infrequently has appeared that the tumor might have been removed from its bed, leaving the sexual organs in a normal condition for subsequent child-bearing. In every celiotomy the tumor and its relationship with the uterus should be carefully studied to determine whether a mutilation of the patient may be avoided. In many interstitial growths, as well as in subperitoneal tumors, it is possible to remove the tumor alone. This is naturally most desirable in young women of child-bearing age, not only to avoid an enforced sterility, but also the ill effects of a premature menopause. But the unfavorable features of a myomectomy must also receive consideration. If the tumors are multiple, the removal of each one from its bed may be a tedious procedure, dangerously prolonging the operation; it is always possible to overlook a small growth which may subsequently grow and demand another operation, the uterine wall may be so mutilated that it can not endure the distention of a subsequent pregnancy and may rupture; if the bed of the tumor is large, or if many must be closed, the obliteration of the dead spaces may be difficult or impossible, oozing of blood, if not hemorrhage, is to be feared, and infection is likely to occur. It is not possible to lay down dogmatic rules as to the choice between myomectomy and hysterectomy

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[1] Olshausen gives Spiegelberg the credit of priority in the operation (1874).

A careful but rapid inspection and palpation of the uterus and tumor, the patient's age and circumstances, a consideration of the advantages and disadvantages of the two operations must determine the question in the individual case It is a safe rule, when in doubt, to select hysterectomy as the surer and safer operation.

If myomectomy by enucleation is determined upon, an incision is made over the most prominent portion of the tumor, through its capsule When the white glistening surface of the tumor is exposed, it is shelled out of its bed by the fingers, blood-vessels around its periphery, if necessary, being clamped and afterward tied. The bed from which the tumor is removed is immediately reduced in size by the contraction of the myometrium which surrounds it, but even so it is not always easy to obliterate the cavity. It is usually necessary to trim off redundant portions of the capsule. The best way to obliterate the bed of the tumor is to introduce series of interrupted catgut sutures in tiers, beginning in the bottom of the cavity and ending by sutures of the perimetrium. In cavities of moderate size a continuous tier suture or a mattress suture is the most convenient and quickest method. Oozing may necessitate the use of mattress sutures. It has been found advisable in individual instances to perforate the inner capsule of the tumor and to drain its bed by a gauze strip passed into the uterine cavity and out of the cervix, the abdominal cavity being shut off by suturing the outer capsule of the tumor.

The amputation of subperitoneal pedunculated tumors may be an exceedingly easy and simple operation if the pedicle is small. The author has removed a tumor weighing more than ten pounds attached to the fundus uteri, by transfixing and ligating a pedicle scarcely larger than his thumb. If the pedicle is large and fleshy, its secure ligation may be difficult or impossible and a hysterectomy may be preferable to the myomectomy. Interlacing or chain ligatures may answer the purpose, or the elastic ligature, recommended and used by Olshausen, Sanger, Treub, and many other German and French operators, may be the easiest and quickest way of securing the stump. The elastic ligature is a solid rubber cord soaked for many hours or days before use in a strong sublimate solution, stretched tightly around the pedicle, secured where its ends cross by a silk ligature, the ends cut off short, and the rubber cord around the stump left in the abdominal cavity, which is closed without drainage.

The most satisfactory way of dealing with the pedicle, if it is practicable, is to enucleate or to excise it by a wedge-shaped excision, the blood-vessels being secured separately, if possible, or closed by deep sutures under the wedge-shaped wound Deep interlacing, interrupted sutures in the myometrium completely surrounding the pedicle and tightly tied, or mattress sutures traversing the bed of the pedicle, may secure a more perfect hemostasis. In whatever way it is treated, the pedicle is dropped and the abdomen is closed.

Vaginal Hysterectomy and Myomectomy for Fibromyomata — The author confesses to a prejudice against and a limited experience in a vaginal hysterectomy for these tumors The size of a tumor which can readily be delivered by vaginal section scarcely ever warrants radical treatment unless there is necrosis or malignant degeneration. If it is necessary to resort to morcellation in order to extract the tumor, a supravaginal amputation is an easier and safer operation.

Cervical myomata which are easily enucleated, interstitial and subperitoneal growths of small size and situated in the lower uterine walls which can be readily enucleated or amputated, are naturally well suited for removal by the vaginal route, and no one would propose any other method. The removal of cervical myomata has been described For the removal of corporeal growths, one or the other vaginal vault is opened by an incision around the cervix, and the opening is enlarged by a vertical incision in the median line of the vagina. The peritoneal reduplication being opened as is done in vaginal hysterectomy, the growth is made accessible by retroverting or exaggeratedly anteverting the uterus. In interstitial and non-pedunculated tumors the capsule is incised and the tumor, pulled down with tenaculum forceps, is enucleated by the aid of a forefinger. If the growth is pedunculated, its pedicle is transfixed, ligated, and cut off. If it is difficult to obliterate the bed of a tumor which has been enucleated, the cavity is packed with a strip of gauze the end of which protrudes through the vaginal vault Otherwise the vaginal wounds are closed.

If morcellation of the tumor is attempted, the following principles must be remembered: Wedge-shaped pieces with the bases outward are exsected by a knife or scissors; before the piece is removed a new hold of the tumor or the uterus must be taken farther up, otherwise it may slip up into the pelvic cavity and become inaccessible. If vaginal hysterectomy is to be performed after the morcellation of the tumor, the technic does not differ materially from that for cancer of the uterus, except that in case of fibromyoma bisection of the uterus at least is required, and morcellation of the uterus itself is usually necessary, either before or after the bisection, as may be most convenient. Either clamps or ligatures may be used to secure the

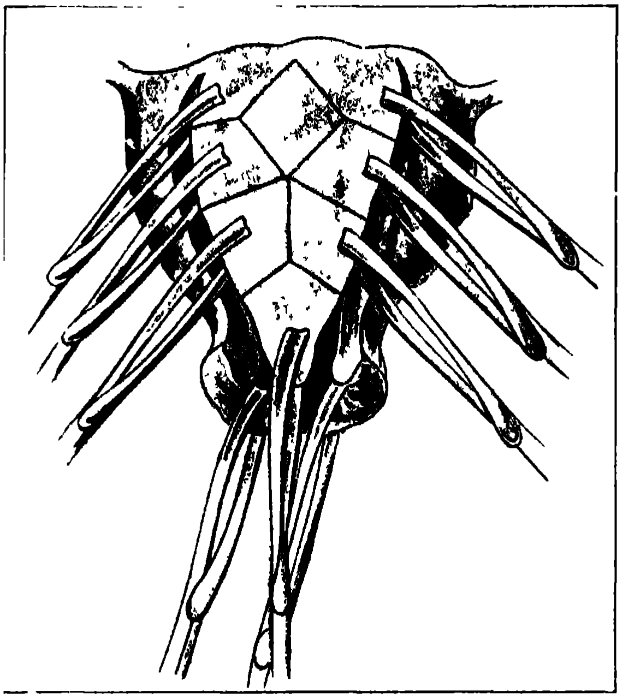

Fig. 347 —Morcellation of the uterus (Doyen).

broad ligaments. The former give greater security against hemorrhage and lessen the duration of the operation, but increase the danger of intestinal obstruction afterward by the adhesion of a loop of bowel to the broad ligament stumps. The latter are more difficult and tedious to apply, are more likely to slip, but permit a neat closure of the vaginal wound and of the peritoneal cavity, and if the patient escapes the danger of hemorrhage, insure her a smoother convalescence.

A word in conclusion is necessary as to special requirements in the removal of cystic and of necrotic tumors by the abdominal route. In the former, the large size which the tumor attains and its fluctuating feel may indicate its puncture or incision ; but it should be remembered that probably little will be gained in this way, and the partial escape of the tumor contents makes the operation less clean than it would otherwise be. There may, however, be one large cavity which can be immediately evacuated, as in one of the author's cases The removal of the tumor is governed by the same principles that obtain in the removal of other fibroids. Cystic tumors are usually pedunculated and should be amputated after the transfixion and ligation of the pedicle. Enucleation of an interstitial fibrocystic growth is usually impracticable. Anything but a pedunculated tumor indicates a hysterectomy, and the former may also require the removal of the uterus on account of the vascularity of the pedicle. This applies particularly to telangiectatic growths If the tumor is necrotic, care must be taken not to leave infected tissue within the pelvis A panhysterectomy seems the most logical procedure as a rule, but the author has successfully twice done myomectomy and twice a supravaginal amputation for necrotic and infected tumors in the puerperium

The Indications for a Radical Operation in Fibromyomata.—There is no excuse for dogmatism, prejudice, or self-interest in deciding this important question. A conscientious surgeon, who carefully considers his patient's interests alone, will probably not operate in much more than 20 per cent. of his cases. Malignant degeneration, telangiectasis, cystic degeneration, and necrosis are positive indications, but, as Olshausen points out, all these dangerous degenerations together do not affect more than 5 per cent of all cases. A bleeding that is reducing the woman to invalidism or endangers her life, and that is not controlled by palliative treatment, indicates an operation. Impaction of the tumor in the pelvis, with pressure symptoms in the bowels and urinary tract, may demand operation. A steady growth which promises the attainment of great size by the tumor indicates an operation before the bulk of the growth becomes excessive.

The patient's circumstances, age, and social state must be considered. If invalidism in her means pauperism, an operation may be justifiable that would not be so in a woman of means, able to rest and spare herself as much as possible. If the patient is a single woman with no one dependent upon her, she is justified in taking a risk that the mother of a family, a wage-earner who supports her relatives, or the nurse of an invalid parent should avoid. If the menopause may be expected shortly, a point might be strained to tide a woman over the few remaining months or years until the bleeding ceases and the tumor shrinks, although it must be remembered that in exceptional cases continued growth or degeneration of the tumor compels a resort to operation after the menopause. If, on the other hand, the woman is comparatively young and must look forward to years of invalidism and suffering, she may prefer the operative treatment, and her physician is justified in advising it.

Evidence of organic disease in the heart or kidneys of a patient would naturally deter the surgeon from undertaking a capital operation, and the extreme anemia which is too often encountered is an unfavorable factor. A hemoglobin percentage below 30 is usually considered a contraindication to anesthetization and a capital operation in surgery, but the gynecic surgeon must occasionally operate on a patient with but 10 per cent. of hemoglobin. In one of the worst cases in the last category to recover the author ever saw, the patient was as energetically supported and stimulated as possible in the two weeks which commonly intervened between the hemorrhages; the operation was undertaken a day or two before the expected flow and a submammary injection of a quart of normal salt solution was given just before anesthetization. Her convalescence could not have been more satisfactory. It is sometimes necessary to undertake an operation in spite of kidney or heart disease. The longer it is postponed, the worse the patient grows. After as energetic preparatory treatment as possible, elimination for the kidneys, stimulant for the heart, the operation must be performed, often with gratifying success, but obviously with a higher mortality than is the rule The proportion of operable cases will naturally increase as the mortality of operations for fibromyomata decreases. At present it is a fair statement to make to the patient and her family that the mortality of the operation is about 5 per cent. It is less than that in favorable cases. But allowing for cardiac weakness which can not be foretold, and other unforeseen complications and accidents, it is better to avoid the reproach of having induced a patient to consent to operation by making it appear less dangerous than is actually the case, and to represent the danger as somewhat greater, rather than as somewhat less, than the truth.

Sarcoma of the uterus may affect the corporeal and cervical endometrium or the uterine wall. The last-named variety is considered here. The tumor is derived from the intercellular connective tissue, the adventitia of the blood-vessels, or possibly from the conversion of muscle into sarcoma cells. Spindle-cell are four times more frequent than round-cell sarcomata The overwhelming majority of cases owe their origin to a sarcomatous degeneration of a fibromyoma. The statistics of A. Martin and von Franqué [1] indicate that 3 per cent. of myomata undergo sarcomatous degeneration. This estimate is generally regarded, however, as too high. Sarcoma of the uterus is a rare growth. Their proportion to carcinomata is 1 to 40 or 50. A myosarcoma does not necessarily grow very rapidly; it is inclosed at first in a capsule and only invades surrounding tissue or gives rise to metastases late in its history; it has often been spoken of, therefore, as a comparatively benign tumor, which is not correct. The duration of life is about that of cancer of the uterus, and metastases occur in three-quarters of the cases A primary sarcoma of the uterine wall is usually rapid in growth and has an

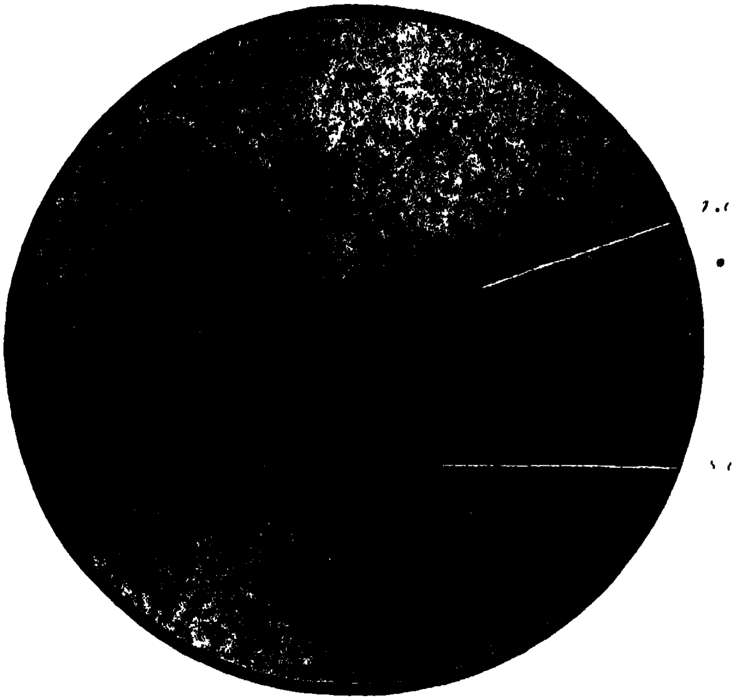

Fig 348.—Sarcoma of uterus with round and spindle cells: s c, Spindle cells; r.c, round cells (McConnell and J. C. Hirst)

early fatal termination. It is prone to lymphangiectasis, cystic degeneration, and necrosis. Fatty, hyaline, and myxomatous degenerations are also noted.

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[1] See Gessner, Veit's "Handbuch der Gyn.," vol 3^2.

The manner of growth is by invasion of the surrounding myometrium, extension into the pelvic connective tissue, perforation of the perimetrium, and subsequent involvement by contiguity of the intra-abdominal structures There is frequently a submucous growth, necrosis of the tumor, and discharge of large fragments through the os.

A curious and very interesting variety of uterine sarcomata are the so-called *recurrent fibroids.* A fibroid polyp may be removed repeatedly from the uterus and only after the sixth or seventh recurrence present the microscopical evidences of sarcoma. A positive diagnosis of sarcoma of the uterine wall can only be made by the microscopical examination of the tumor after its removal or of pieces discharged by the os. The following clinical evidence should always excite a suspicion of sarcoma, may justify the diagnosis, and may indicate hysterectomy (Gessner):

1. If a tumor regarded as a myoma fails to shrink after the menopause and continues to grow.
2. If such a tumor causes a return of hemorrhages after the menopause.
3. If cachexia, preceded by general malaise, appears, associated with a uterine tumor.
4. If a uterine tumor causes symptoms of ill health that can not be accounted for by the size or position of the tumor.
5. If ascites develops with a uterine growth.
6. If a uterine tumor grows very rapidly and changes markedly in consistency to a soft and friable growth.
7. If a fibroid polyp recurs after its removal.

The treatment of sarcoma of the uterus is complete hysterectomy by the vaginal or abdominal routes or both.

The success of radical treatment has not been very encouraging. Recurrences, metastases, and implantation metastases have occurred in a large proportion of the small number of recorded cases.

PART VII.

DISEASES OF THE ENDOMETRIUM; DISORDERS OF MENSTRUATION; STERILITY.

Endometritis.—The anatomy of the corporeal endometrium and its differentiation from the cervical endometrium have been considered. A characteristic important to remember before studying its inflammation is its freedom in a state of health from microbic infection. The genital canal is divided into normally infected and normally sterile regions. The boundary line between the two is the external os. The mucous membrane above that point contains no bacteria. The vaginal mucous membrane, on the contrary, is the habitat of Doderlein's bacillus, often of a yeast-fungus, and occasionally of pathogenic germs, usually in a state of diminished virulence. All inflammations of the endometrium may be broadly divided into the infectious and the non-infectious. The former depend upon microbic invasion of the endometrium. They are:

Septic endometritis, dependent upon pyogenic cocci and the anaerobic saprophytes. This disease is rare except after abortion and labor. It may follow operations upon the cervix and the uterus or the insertion of instruments into the uterine cavity. The result is a necrosis of the superficial endometrium and a granulation-cell barrier in the deeper layers of the mucosa, upon which the woman depends for her safety. Except in a puerpera this safeguard is almost always sufficient. The necrotic endometrium is exfoliated, the micro-organisms perish in a struggle for existence with the body-cells, and the patient is cured. But, as often happens in the puerperium, the cocci may penetrate the lymph-channels, blood-spaces, and myometrium; localized suppuration in the uterine wall, peritonitis, and general infection may follow with the likelihood of a fatal result. The sapremic endometritis dependent upon microbic decomposition of putrescible material *in utero*—sloughing fibroids, for example—is not usually followed by microbic invasion of the tissues, but a septic intoxication, possibly fatal, may be observed.

Gonorrheal endometritis is an inflammation of the mucous membrane in which gonococci are found in and under the epithelium, and penetrating the myometrium perhaps to the perimetrium. The mucosa is much thickened. The surface epithelium is exfoliated or shows a transitional stage to the many-layered

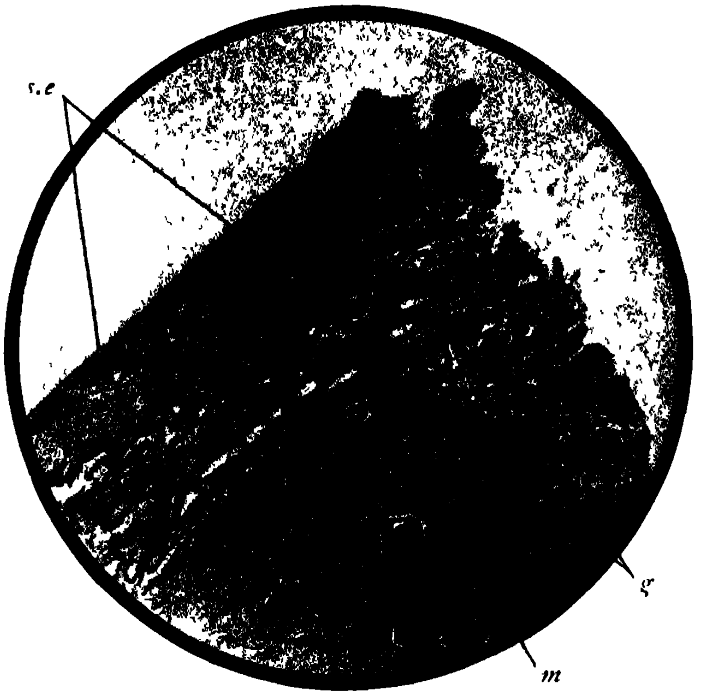

Fig 349.—Normal endometrium of corpus uteri: *g*, Glands; *m*, myometrium; *s.e*, surface columnar epithelium (McConnell and J. C. Hirst)

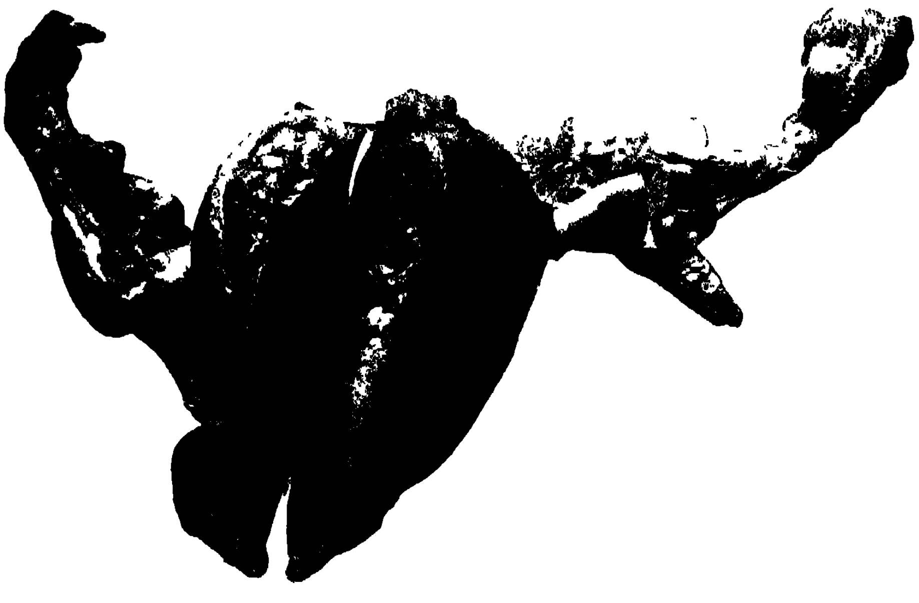

Fig. 350.—Tuberculosis of endometrium (A. E. Roussel).

squamous type. The glands are unaltered except that they are distended with secretion, and the cells may be increased in number. There is edema and a round-cell infiltration of the interglandular tissue with a few pus-cells. There is also a cellular infiltration of the myometrium, which may lead to abscess formation in the uterine wall.

Tuberculous endometritis is not primary, but secondary to tuberculosis of the tubes or cervix. Three forms are usually differentiated—miliary, interstitial, and ulcerative. Tubercle bacilli are the infecting agents, but their presence is difficult or impossible to demonstrate. The interior of the uterus may be covered with a caseous material. The underlying layer of surface cells is unbroken. Beneath them are masses of epithelioid cells, occasionally giant-cells or round-cell infiltration, and possibly typical tubercles. The symptoms are leukorrhea and metrorrhagia with the associated inflammation of the tubes or of the cervix. The curet may remove caseous material and endometrium in which a microscopical examination may demonstrate the nature of the disease. The tuberculin test is always of some value in suspected tuberculosis of the internal organs.

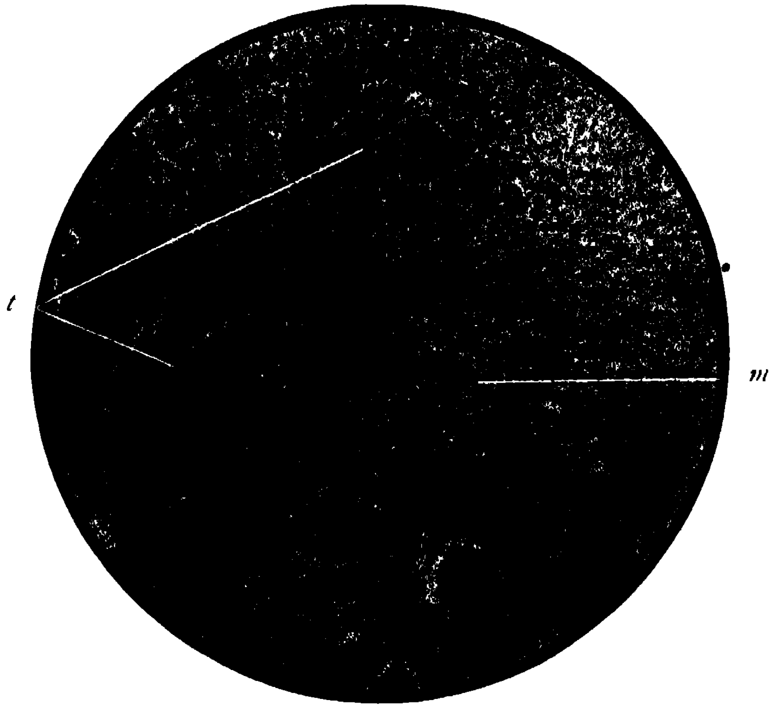

Fig. 351.—Tuberculosis of uterus: *t*, Tubercles with giant-cells; *m*, myometrium (McConnell and J. C. Hirst).

Syphilitic endometritis is probably the same as the syphilitic endometritis gravidarum, though no study has been made of the condition except in pregnant women.

Diphtheritic endometritis has only been demonstrated bacteriologically in the puerperium.

Acute infectious endometritis may be associated with the infectious fevers, as cholera, typhus, the exanthemata, typhoid fever, dysentery, and influenza, in which there is an intense hyperemia, destruction of the surface epithelium, blood extravasations, glandular hypertrophy, and round-cell infiltration of the interglandular connective tissue.

The symptoms of infectious endometritis differ in the various forms noted above. Associated with the infectious fevers a metrorrhagia justifies the diagnosis. The same symptom is the first manifestation of syphilitic and possibly of tuberculous endometritis, though a leukorrhea is more frequent in the latter than hemorrhages. Septic endometritis manifests itself by a serosanguinolent and later a purulent discharge. If the myometrium is involved, there is pain, but not otherwise. Some elevation of temperature is always noted, evanescent if the attack is mild, but persistent and alarming if the myometrium is involved, if the lymph-channels or blood-spaces are infected, and if the inflammation spreads to the peritoneum.

Gonorrheal endometritis is recognized by a greenish-yellow purulent discharge from the os, thin in consistency, but mingled with masses of thick ropy mucopus from the cervix In a fresh infection it is easy to detect gonococci under the microscope in the discharge gathered from the cervix on a pledget of cotton, and there are the symptoms of specific infection of the urethra, Skene's glands, the vulvovaginal glands, and the vagina. There may be also granular vaginitis, erosion of the cervix, and vulvitis. In chronic cases the positive diagnosis is difficult or impossible. Gonococci may be undiscoverable It has been suggested that glycerole of tannin tampons be placed against the cervix and left in position for six hours, the discharge collecting on them being examined for gonococci, but even this plan may not succeed. It is justifiable to make a presumptive diagnosis of gonorrheal endometritis if there is always a rope of thick mucopus hanging out of the cervix, a persistent mucopurulent leukorrhea resisting treatment, an exacerbation of the discharge following alcoholic or sexual excess, fatigue or cold, and a menorrhagia in the form of prolonged rather than profuse menstruation with decreased intermenstrual intervals. A tubo-ovarian inflammation, if it exists, strengthens the suspicion of specific infection.

The treatment of infectious endometritis differs with the variety Tuberculosis indicates hysterectomy if there is no tuberculous lesion in other important organs and if the disease can be eliminated by the removal of the uterus and its appendages. Syphilitic endometritis calls for mercury and iodid of potassium and a curettage if the menorrhagia persists after the patient is brought under the influence of the antisyphilitic remedies. Septic endometritis, if mild and evanescent, demands no local treatment, except the ice-coil or an ice-bag on the hypogastrium and rest in bed. Graver cases call for irrigation of the uterine cavity by sterile water douches through a two-way catheter and a gentle curettage of the uterus with a dull curet and the curetment forceps to remove the necrotic endometrium without penetrating the new-formed granulation layer under the infected mucosa.

The treatment of gonorrheal endometritis demands the exercise of good judgment and the careful study of the individual case. The object should be to prevent, if possible, the extension of infection from the vagina to the cervix and endometrium by the energetic and early treatment of specific vulvitis and vaginitis (page 138). The premature resort to intra-uterine treatment may carry gonococci into the uterus. If intra-uterine infection occurs, as it probably will in spite of every effort to prevent it, the attempt should be made to destroy the gonococci lodged in the endometrium before they invade the tubal canals whence they can only be removed perhaps by salpingectomy.

After a thorough vaginal disinfection, by tincture of green soap, hot water, and pledgets of cotton, followed by a permanganate of potassium douche (f℥j saturated solution to Oij), the cervical canal is wiped out by a pledget of dry cotton on an applicator to remove the tenacious plug of infected mucus This is followed by the application to the cervical endometrium of a 20 per cent. solution of argyrol on a pledget of cotton, which is allowed to remain in the cervix for five minutes Then a Fritsch's intra-uterine catheter, previously boiled, is passed into the uterine cavity, which is irrigated by the permanganate of potassium solution. Following the irrigation an application of the argyrol solution is made to the corporeal endometrium. This treatment is repeated daily until the uterine discharge becomes normal A week or more may be required. In spite of apparent success, the slow development of a pyosalpinx may be observed later. Curettage is contraindicated in acute gonorrheal endometritis. If the gonorrheal endometritis has become chronic, in which stage the physician most often sees it, there is no treatment which promises such speedy and sure relief as a dilatation of the cervix, a thorough curettage, and the application to the curetted surface of pure carbolic acid introduced by an applicator on a pledget of cotton. This treatment is contraindicated if there is coincident tubo-ovarian inflammation, unless it is followed, as it should be, by an immediate abdominal section to deal with the pelvic inflammatory condition, or is performed in a well-equipped clinic with the understanding that an abdominal section may be required at any time during the convalescence from the curettage. If for any reason the latter operation is inadvisable or is refused, local treatment of the endometrium may be attempted, but it is uncertain, tedious, often painful, and not without risk. Applications of argyrol, of nitrate of silver solution, of iodin, carbolic acid, carbolic acid and glycerin, and of weak solutions of chlorid of zinc; the insertion of medicated bougies containing argentum Credé, protargol, argyrol, and other astringents and antiseptics; intra-uterine irrigations of formalin, 1 : 6000, of permanganate of potassium, and of sublimate solutions are the best remedies. Any intra-uterine treatment should be preceded by an irrigation of Oij of boracic acid solution, gr. x to f℥j, to wash away the mucous discharge bathing the endometrium and to allow the remedies employed to reach the diseased surfaces.

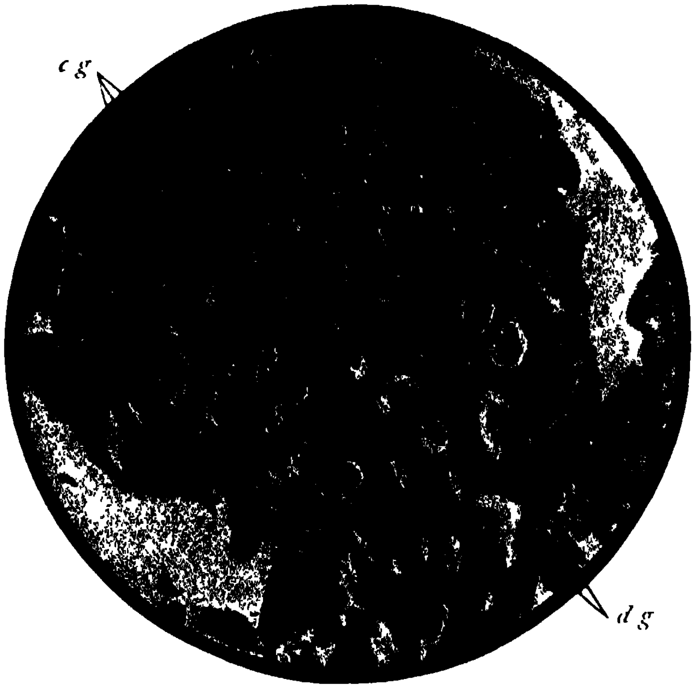

Fig. 352.—Chronic hyperplastic glandular endometritis: *c g*, Convoluted glands; *d.g*, dilated glands (McConnell and J. C. Hirst).

It may be easy to cure the gonorrhea of the corporeal endometrium; it is almost impossible to reach gonococci lurking in the deep cervical glands. The woman may never be rid of a mucopurulent leukorrhea, more or less infectious, until a high amputation of the cervix is performed.

Chronic hyperplastic endometritis does not depend upon microbic infection, though the ultimate stage of an infectious endometritis may be chronic congestion and hyperplasia, so that infection may possibly be the starting-point of the chronic disease. Much more frequently the cause is found in a condition determining an oversupply of blood to the uterus. These conditions are so numerous that hyperplastic endometritis is by far the commonest disease of women. Displacement of the uterus; subinvolution; injuries and diseases of the cervix; persistence of decidual cells (deciduoma) in the endometrium; tight lacing; violation of the laws of sexual hygiene; obstruction to the pelvic circulation by pelvic and abdominal tumors, especially those projecting from the uterine wall into the uterine cavity; by heart and liver disease, and by constipation; overexertion in the erect posture; stenosis of the cervix, dysmenorrhea, and a consequent irritation of the endometrium, and nervous excitation are some of the conditions that cause a chronic uterine congestion and a hyperplasia of the endometrium. The hyperplasia may affect the glandular or interstitial structures, or both. In hypertrophic glandular endometritis the glands are increased in number, acquire a corkscrew form, and display a dilatation of the gland-spaces, with excrescences of epithelium in their lumen. There is also a proliferation of epithelium upon the surface of the endome-

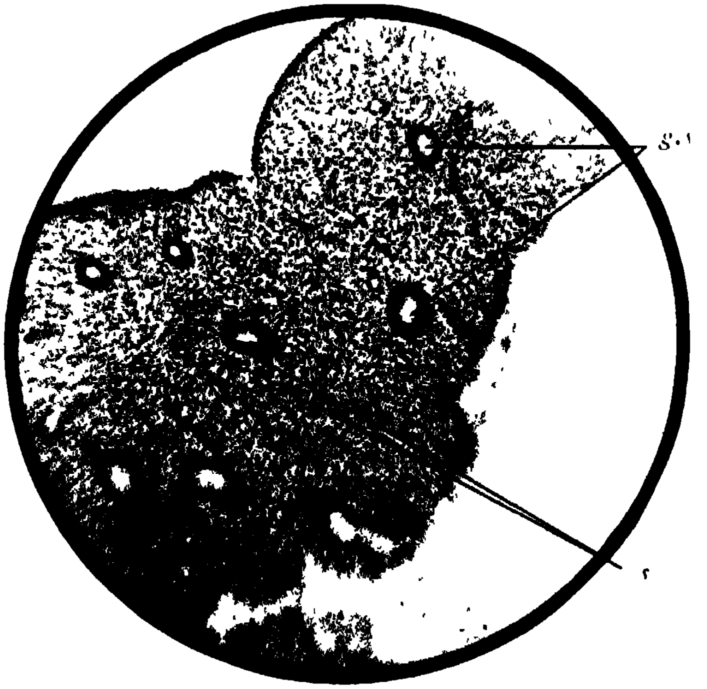

Fig 353.—Chronic interstitial endometritis: *g.s*, Gland-spaces; *s*, stroma, greatly hypertrophied (McConnell and J. C. Hirst).

trium, but nowhere a duplication of the single epithelial layer in the glands or on the surface, except in elderly women. In the interstitial form there is at first a round-cell infiltration of the interglandular connective tissue. The glands are widely separated and compressed; there may be exfoliation of the surface epithelium. In the later or chronic stage the round cells are converted into spindle cells, scar tissue is formed; the glands are so compressed that they atrophy and disappear; the uterine mucosa is reduced to a single layer of epithelial cells on the surface of the uterine cavity (atrophic endometritis) There is frequently a mixed form of interstitial and glandular endometritis, and varying gradations may be observed between the purely glandular and the interstitial hypertrophy.

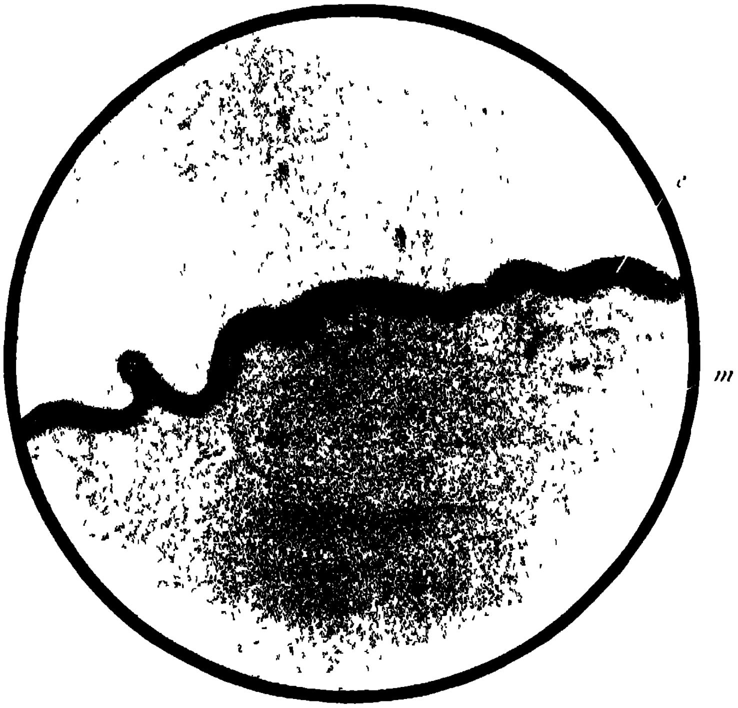

Fig. 354.—Atrophic endometritis, showing complete disappearance of glands: *c*, Remnant of endometrium, *m*, myometrium (McConnell and J C. Hirst)

A curious anomaly rarely observed on the surface of cervical polyps and even over the whole corporeal endometrium is the conversion of the columnar epithelium into many-layered squamous epithelium (psoriasis uteri).

Another rarity in the histology of endometritis is the persistence of islands of decidual cells after abortion, surrounded by layers of granulation-cell infiltration (deciduoma).

The *symptoms* of chronic endometritis are menorrhagia, metrorrhagia, and leukorrhea. Ordinarily there is a profuse, prolonged menstruation with shortened intermenstrual interval. In exceptional cases there is a continuous bloody discharge, worse at intervals corresponding to the menstrual periods, or in consequence of physical effort or nervous excitement, which so reduces the patient that she becomes as anemic as the subject of a fibroid tumor or cancer of the cervix.[1] Leukorrhea is commonly observed in the intermenstrual periods, the discharge coming mainly from the cervical glands in the shape of thick ropy mucus, though the corporeal endometrium may contribute a thin serosanguinolent discharge. There is often noted an exacerbation or the appearance of a leukorrhea midway between the menstrual periods This discharge may be tinged with blood or may be entirely hemorrhagic. Usually there is no pain with endometritis, but rarely the appearance of the intermenstrual discharge is regularly associated with severe pain. The intermenstrual pain to which Priestly first called attention, or the "Mittelschmerz" of the Germans, is difficult to explain It has been attributed to the first onset of the premenstrual congestion which is supposed to begin at this time and to the nervous excitation which accompanies it. As there is never an endometritis without some degree of metritis, a bimanual examination reveals the increased size and weight of the uterus and changes in its consistency. It is softer than normal if the congestion is of comparatively recent origin, hard perhaps as stone in the ultimate stages of the disease. The physical examination should always take into account the possible causes of uterine congestion, which may be detected in a vaginal or abdominal examination.

The **treatment** of chronic endometritis is a dilatation of the cervical canal, a thorough curettage, and at the same time the removal of the cause of uterine congestion Neglect of the last named precaution makes the success of treatment doubtful or impossible. Hence a curettage must often be combined with repairs of the injuries of childbirth, correction of uterine displacements, the surgical treatment of pelvic inflammatory disease, and the removal of tumors from the uterus, the uterine cavity, the cervix, and the pelvis or abdomen Constipation must be combated, a weak circulation may demand systematic rest or digitalis Gymnastic exercises or open-air sports may be indicated to give tone to the whole muscular system as well as to that of the circulatory apparatus Efforts to prevent conception, and other violations of the laws of sexual hygiene should be forbidden. It may be necessary to take an ambitious school-girl from her studies or to remove a cause of mental activity or nervous strain

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[1] The author has seen six young girls under fourteen years of age whose menstruation began and continued as a profuse metrorrhagia for months until curettage relieved them. In five there was glandular, in one interstitial endometritis

Medicinal treatment may be required in addition to the curettage or in place of it. A combination of hydrastinin, ergotin, and stypticin is the most efficient astringent remedy. Suprarenal extract (3-grain tablets) comes next in efficiency.[1] Gelatin hypodermatically, 15 c.c. of a 10 per cent. solution in sterile normal salt solution, or by the mouth is worth a trial. Local applications to check uterine hemorrhages are very properly in disfavor and are falling into disuse. The uncertainty of results and the dangers of their use make it almost unwarrantable to recommend them. Intra-uterine applications of astringents and styptics may be occasionally employed by the expert specialist with all the care and caution that their use demands, but they are not to be resorted to routinely by the general practitioner. Hot-water vaginal douches (a gallon at 115°–120° F.) and glycerin tampons reduce a temporary congestion, but they can not be expected to relieve permanently a chronic hyperplastic endometritis.

The endometrium removed by the curet should always be carefully observed both macroscopically and microscopically. To the naked eye it is soft, thick, dark red in color, and infiltrated with blood. Whitish villosities are numerously scattered through it looking like grains of sago or tapioca. This is the common "fungous endometritis" or the hypertrophic glandular form. In the interstitial variety the curet may remove a very small quantity of thin ribbon-like stripes of membrane Under the microscope are seen the characteristic appearances of the two forms of endometritis already described.

Werth's[2] observations of five uteri extirpated at various periods after the removal of the mucosa by a curet indicate that the endometrium is restored from the depths of the utricular glands within five days after a curettage. An obliteration of the uterine cavity wholly or in part has been noted four times after curettage in the puerperium (Döderlein) Such a result might be possible after too vigorous a use of the curet in the non-puerperal uterus.

Neoplasms of the Endometrium.—**Adenocarcinoma** of the endometrium may have its origin in the surface epithelium, the glandular epithelium, or in a fibro-adenomatous polyp. The growth is at first isolated, usually extending into the cavity of the uterus, sending out numerous fine finger-like processes, and possessing, therefore, a papillomatous character, or later forming a large, dome-shaped mass, soft in consistency and prone to necrosis. A growth beginning within the gland may extend into

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[1] It is said to be a common practice among prostitutes to take indigo in order to prevent the appearance of menstruation when it might interfere with their trade The action of this substance as a uterine hemostatic deserves more attention than it has received.

[2] "Arch. f. Gyn.," Bd. xlix, H. 3.

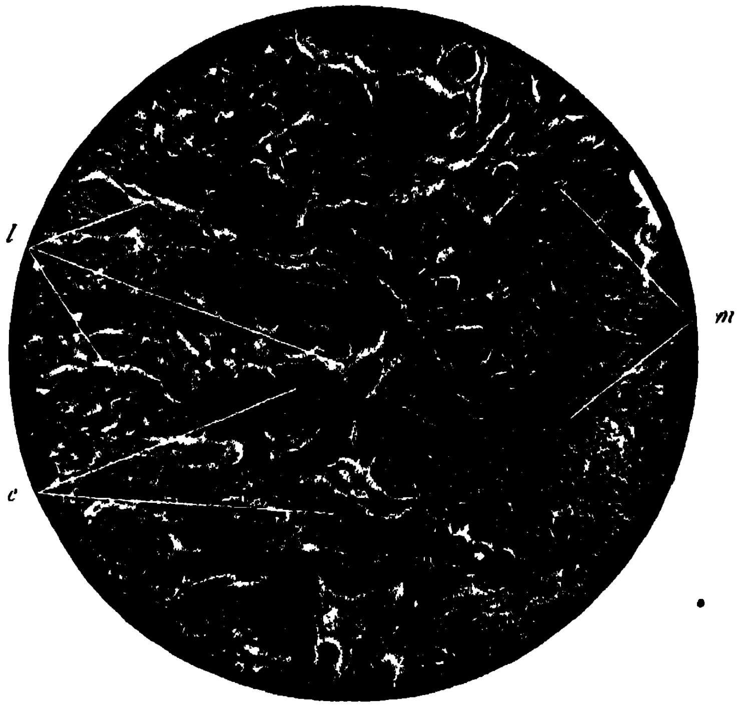

Fig. 355.—Adenocarcinoma of uterus: *e*, Enormously hypertrophied epithelium lining glands; *m*, myometrium, somewhat infiltrated by cancer-cells; *l*, lumen of gland (McConnell and J. C. Hirst).

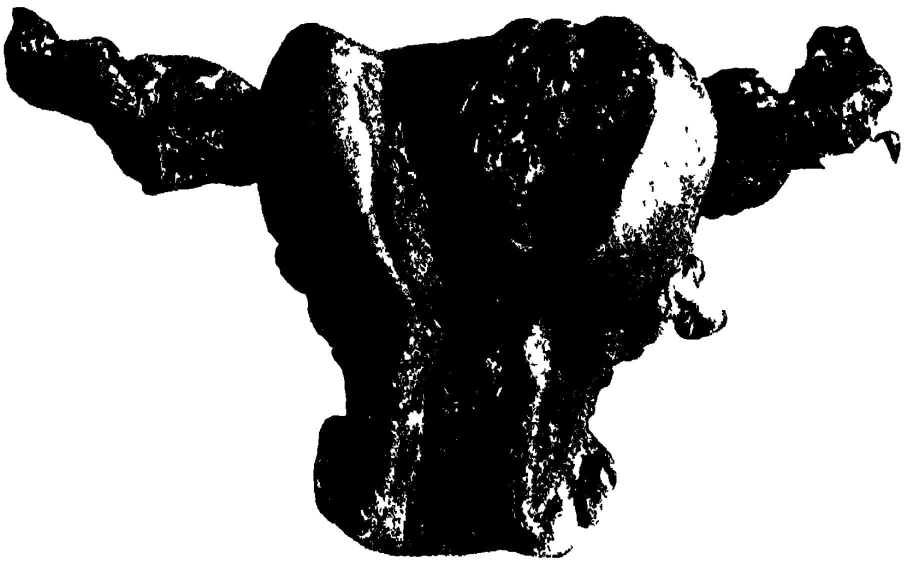

Fig. 356.—Adenocarcinoma of endometrium

the myometrium, even to the perimetrium, under which may be seen yellowish-white soft lumps.

On the surface of the endometrium there is a multiplication of the epithelial layer, and numerous fine finger-like excrescences, consisting at first mainly of epithelium, later provided with a stroma. These processes send out branches and everywhere is seen an exaggerated hyperplasia of the epithelium. The nuclei of the cells are gradually increased in size, become irregular in outline, staining intensely. The glands are enlarged; numerous offshoots of new glands are seen, irregular in arrangement and lined with many layers of epithelium instead of the normal single layer. The basement membrane is penetrated and the glands communicate. The gland-spaces are dilated, containing desquamated epithelial cells, polymorphonuclear leukocytes, and detritus.

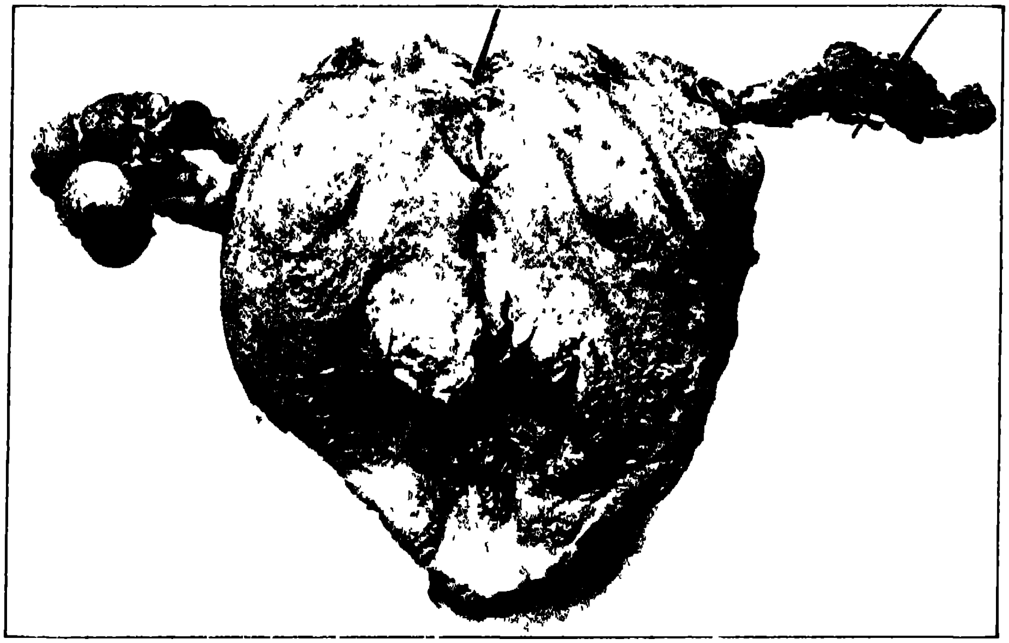

Fig. 357.—Adenocarcinoma of endometrium.

The later stage of this form of cancer is ulcerative and necrotic large crater-like pits developing in the myometrium perforating the uterus, involving by contiguity the intestines, omentum, and peritoneum, by extension along the lymphatic ducts the iliac, lumbar, and even the inguinal lymphatic glands, and by metastases or extension the tubes and ovaries, liver, spleen, lungs, and other structures; but involvement of the lymphatics is the exception, as in the case of cervical cancer, and for the same reason; metastases are also late in occurrence and exceptional.

The commonest age for the development of an adenocarcinoma is between fifty and sixty, but it may be found in women at and under thirty, or in extreme old age. Child-bearing has no part in the predisposition to this form of cancer. The majority of the author's cases have occurred in single or sterile women. One is struck with the frequent association of myoma and adenocarcinoma of the corpus uteri, but the former probably has no part in a predisposition to the latter. A large proportion of elderly women

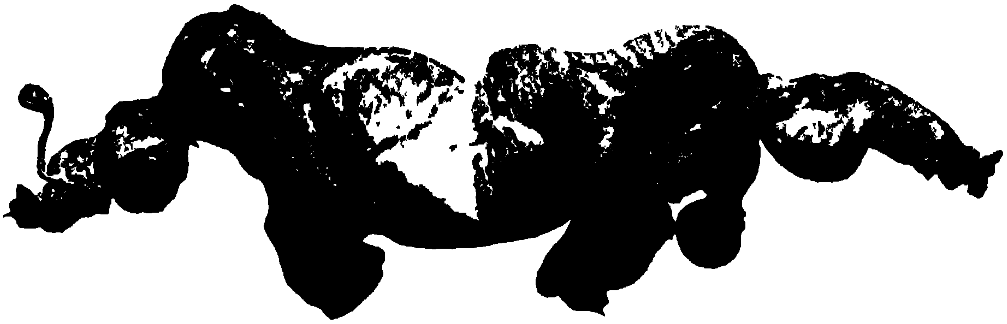

Fig 358 —Adenocarcinoma of endometrium and subperitoneal fibroma.

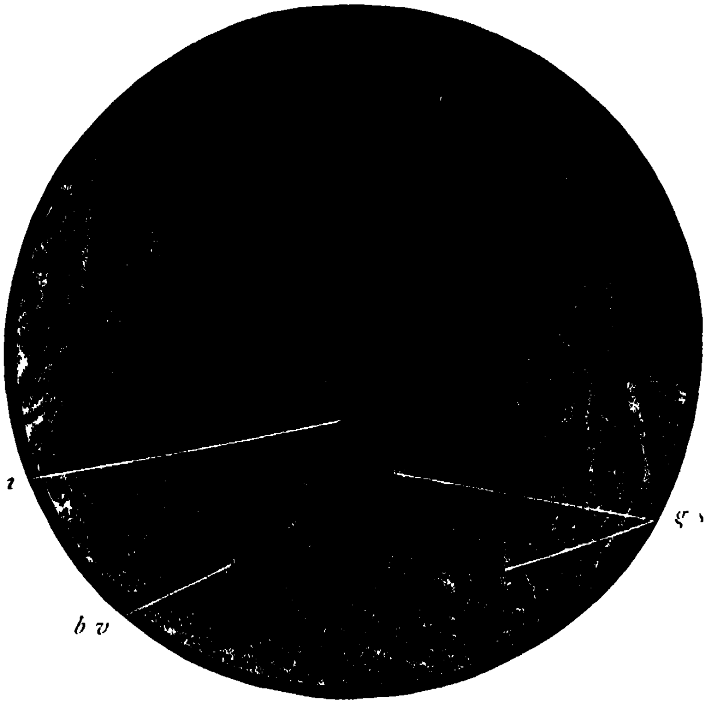

Fig. 359 —Malignant adenoma of uterus: *g s*, Glands penetrating deeply into myometrium, *b.v*, blood-vessel; *i*, cancer-cell infiltration of myometrium (McConnell and J C Hirst).

have uterine myomata, hence they are frequently found associated with a disease of advanced age. The myoma, if it exists, is rarely invaded by the carcinoma. Inclosed in a capsule, poorly nourished, and possessing, as a rule, no epithelial structures, it offers an unfavorable field for the invasion of a cancer It is possible, however, as already pointed out, for an adenomyoma to be the starting-point of an adenocarcinoma.

There may be a malignant adenoma of the corporeal endometrium as well as of the cervix (Fig. 359). Clinically there is no distinction to be made between this growth and adenocarcinoma.

Symptoms and Diagnosis.—The first symptom to attract attention is a serosanguinolent discharge. If this discharge appears after the menopause, with a healthy condition of the cervix, it is strongly suggestive of adenocarcinoma of the corporeal endometrium. Practically the only other explanation is a benign intra-uterine polyp.[1] The bloody discharge is at first irregular and intermittent and is not foul. Later the bleeding becomes almost or quite continuous, with exacerbations, and is foul smelling. Hemorrhage is rarely so severe as it is in cancer of the cervix. The uterus is always distinctly enlarged, except in the early stages. The increase in size may be considerable. Pain is by no means a constant symptom. It is usually absent until the later stages of the growth. The general health may not be affected for many months and there may be no loss of weight. In some cases, on the contrary, there is an early appearance of cachexia, a marked decrease in weight, and general malaise. The positive diagnosis can only be made by a microscopical examination of the scrapings removed by a curet. It should be a rule of practice to have uterine scrapings examined after every curettage whether cancer is suspected or not. If there is reason to apprehend a malignant growth of the endometrium, it is possible to remove sufficient material for diagnostic purposes in an office visit by the smallest size Sims' curet; but the preferable plan by far is to carry out a formal curettage under anesthesia, removing all the endometrium and subjecting it to microscopical examination. A rapid diagnosis by the freezing process is practicable, so that on receiving an unfavorable report the surgeon may at once proceed to a radical operation; but the better plan is to give the pathologist time for a careful study of the specimens, embedded in celloidin. Three or four days to a week should be allowed between the exploratory curettage and the radical operation, if the latter is indicated. It is often possible to be morally sure of the malignancy of a specimen removed by the curet on its macroscopical appearance. A thick, whitish, fleshy mass, quite different in appearance and feel from the thickest hypertrophied endometrium, from pieces of placenta or decidua retained *in utero* or from mucous polyps has often enabled the author to anticipate the pathologist's report; but one is never justified in resorting to a radical operation without a positive diagnosis of malignancy from the microscopist. If there is a doubtful or uncertain report, there should be a second curettage six weeks after the first and another microscopical examination of the scrapings.

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[1] The author has reported two cases of metrorrhagia beginning years after the menopause, due to benign mucous polyps in the uterine cavity. "Therapeutic Gazette," Oct. 15, 1901.

Treatment.—There is but one treatment of adenocarcinoma of the endometrium—panhysterectomy. If the disease is detected in its very incipiency, a thorough curettage has been known to effect a permanent cure;[1] but the disease when it first comes under medical observation is almost always so far advanced that radical treatment alone should be considered.

If the vagina is capacious, a combined hysterectomy is the most satisfactory, beginning by the vagina and ending by the abdomen, as in carcinoma of the cervix. If the patient is a single woman with a narrow vagina, the abdominal operation alone is the most convenient The author finds himself less inclined with every year to trust to vaginal hysterectomy alone. It is impossible by this route always to remove the appendages, the broad ligaments, and the parametrium as thoroughly as they should be removed, and it is, of course, impossible to investigate the condition of the iliac and the lumbar lymphatic glands except by an abdominal operation It is true that these glands are only exceptionally involved, and only as a rule in inoperable cases, but they should always be examined, and if there is any abnormality in their size and consistency they should be removed by slitting the peritoneum over them on a grooved director and carefully dissecting them out without injury to the important vessels near and on which they rest. In many a case so treated the enlarged gland will not be found cancerous, but enlarged and hardened by inflammation In a few cases in which the author has removed cancerous iliac glands the condition was really inoperable There were recurrence and metastasis in a short time. Nevertheless, an occasional success may be secured by the removal of the glands in a case that would be doomed to certain failure if these glands already cancerous were overlooked and allowed to remain.

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[1] The author has had such a case A woman who had had metrorrhagia for some years with an enlarged uterus was subjected to a thorough curettage. The specimens, which looked suspicious, were submitted to H. L. Williams and H. D Beyea They both reported independently that they found an incipient adenocarcinoma, but the disease was in such an early stage that a subsequent curettage with another examination of the degenerated endometrium was desirable. Six weeks later the uterus was again scraped under anesthesia The scrapings this time had no trace of malignancy. The woman at present, four years later, remains well.

The *prognosis* of the operative treatment is good. The hysterectomy is easier and safer than the same operation for cervical cancer, and there is a recurrence in only one-fifth to one-third of the cases.

Sarcoma of the endometrium arises usually from the deeper interglandular connective tissue, possibly from the blood-vessel walls, and very rarely from the lymphatics (lymphosarcoma) The growth assumes a diffuse or a polypoid form. The former is circumscribed, sessile, and projects into the uterine cavity as an irregularly lobulated tumor. The latter is pedunculated. Gessner[1] has collected 130 cases of sarcoma of the corporeal endometrium—81 polypoid, 49 diffuse. The growth is usually toward the uterine cavity. The myometrium is slowly invaded and only late in the disease. Ultimately the uterine wall is perforated and the intra-abdominal organs are involved. Metastases are exceptional, and if they occur are seen toward the end of the individual's life. There is little tendency to extension of the growth toward the cervix or into the vagina, and very slight inclination to invade the bladder and rectum, which are so commonly involved in cancer of the uterus.

In the diffuse form the endometrium over the growth is destroyed early, in the polypoid form it is preserved in a normal condition until late. The remaining endometrium may be unaltered, may be the seat of hyperplastic glandular and interstitial endometritis, may become atrophic, or be converted into granulation tissue.

The blood-supply may be scanty. On the contrary, it is sometimes so rich that the tumor is telangiectatic. There is a strong tendency to necrosis of the soft mass of the tumor, large pieces of which may be expelled from the uterus Cystic and myxomatous degenerations are occasionally noted. The sarcoma is almost always a mixed round-cell and spindle-cell growth, one kind of cell perhaps predominating over the other. Giant-cells on a careful examination are discovered in a considerable proportion of the cases. They were present in all of Whitridge Williams' (3) and in one-fifth of Gessner's (5) cases. Angiosarcoma, cystosarcoma, melanosarcoma, and chondrosarcoma have been observed in sarcoma of the corporeal endometrium. The occurrence of adenosarcoma and carcinosarcoma is doubtful and has not been demonstrated.

Symptoms and Diagnosis.—Sarcoma of the endometrium is a disease of old age in the majority of cases, but it may occur at any time from early infancy. Child-bearing plays no part in the etiology, nor does heredity. The uterus may not be enlarged at

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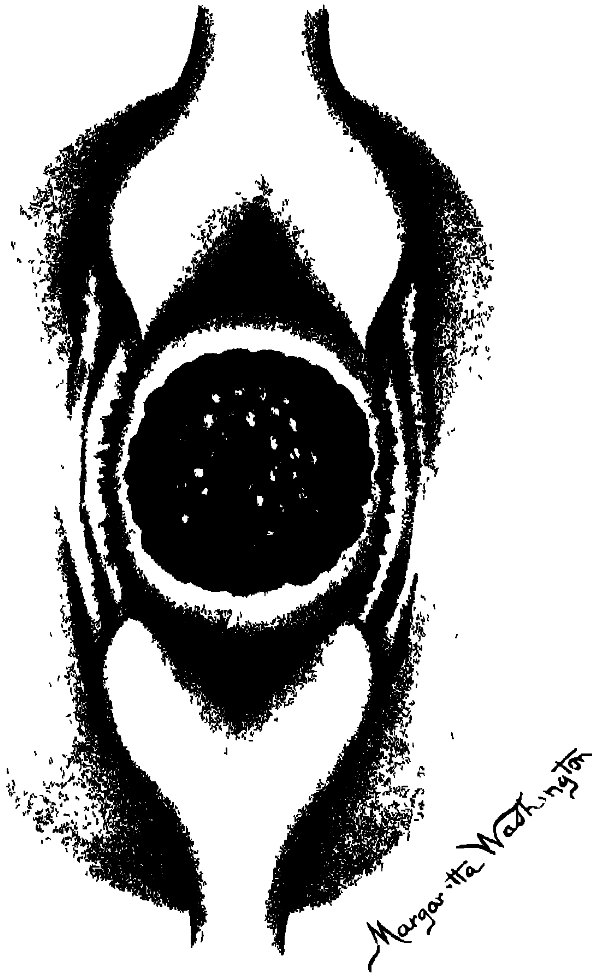
[1] Veit's "Handbuch," vol. 3 ².

PLATE 12.



Sarcomatous degeneration of a fibro adenomatous polyp of the corporeal endometrium

first, but with the increase in the size of the tumor there is necessarily an enlargement of the uterus. Occlusion of the cervix and hematometra are frequently noted. The accumulation of bloody fluid has been enormous. Fifteen liters have been evacuated In such a case the uterus is a cystic tumor reaching to the ribs. Pyometra is not so common and the distention is not so great.

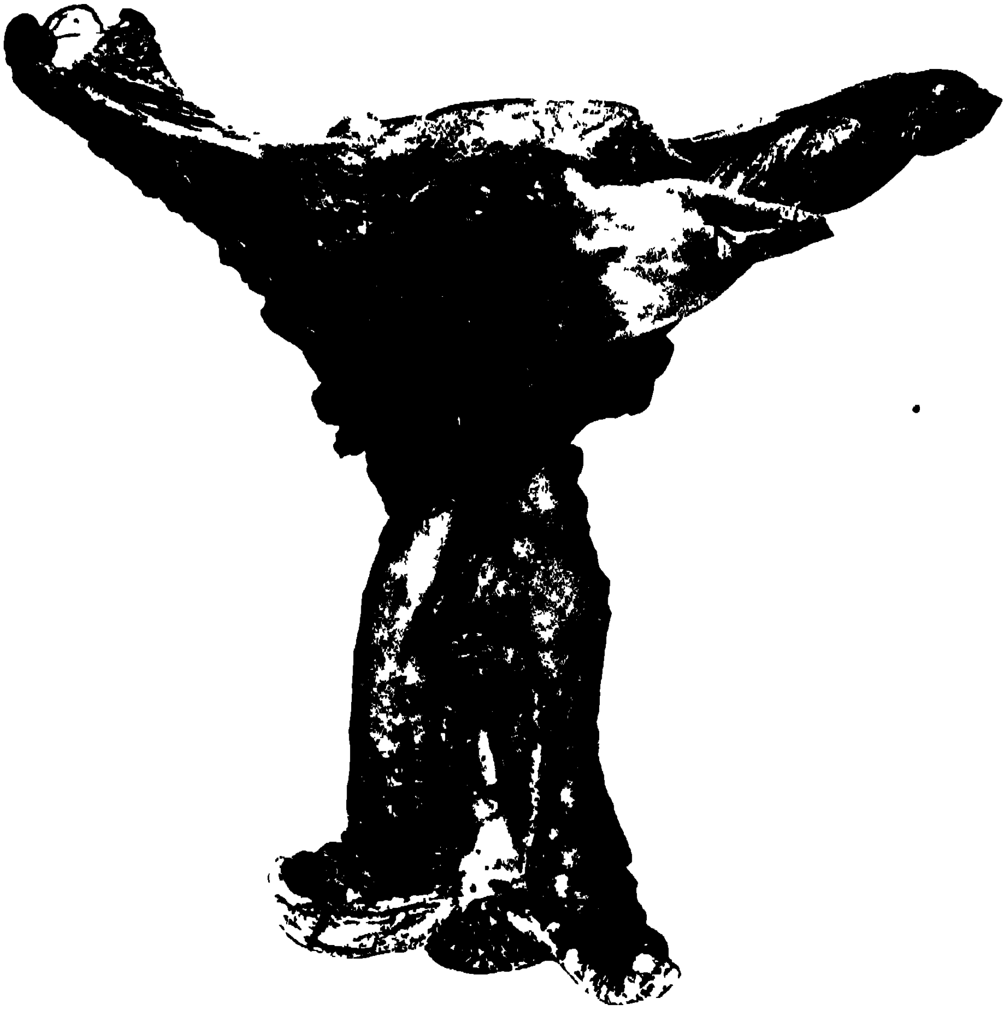


Fig. 360.—Myxomatous polyp of corporeal endometrium. Polyp turned out, showing very slender pedicle attached to left cornu

Pain is not a prominent symptom until the myometrium and the perimetrium are involved. When pain is present, its occurrence at regular intervals has been noted

Inversion of the uterus is frequent in the polypoid form.

There is observed with great regularity a profuse serous leukorrhea, at first odorless, later foul. A bloody discharge succeeds the leukorrhea or accompanies it. These symptoms after the menopause are always suspicious. Owing to the rapid necrosis of the tumor, large pieces of necrotic tissue may be expelled from the cervix, the microscopical examination of which may determine the nature of the tumor; but they may be so disorganized as to be valueless for diagnostic purposes. Although the bladder is very rarely involved, vesical tenesmus is often observed

The average duration of the disease is two years, but it varies from a few months to five years.

The diagnosis can only be made by the microscopical examination of tissue removed from the uterus by a curet or a curetment forceps.

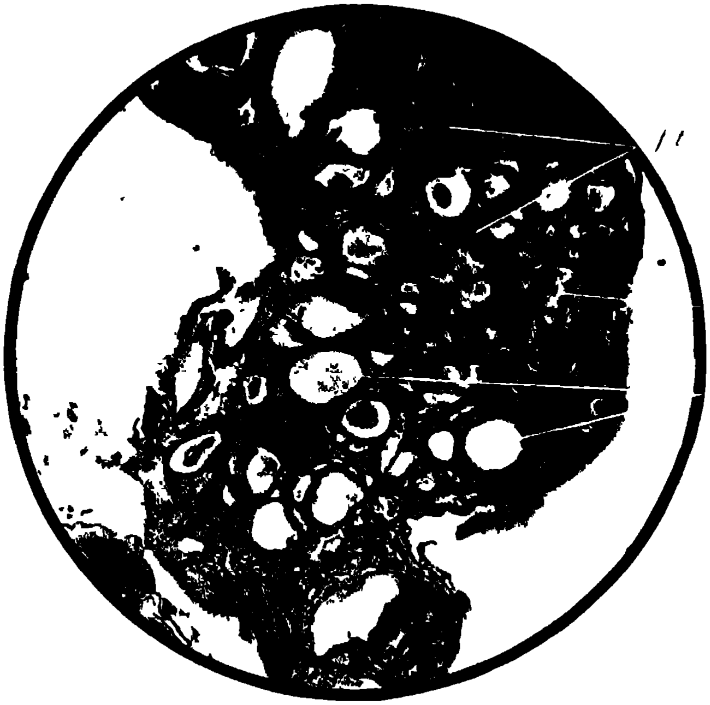


Fig. 361.—Adenomyxomatous polyp of corpus uteri: *f f*, Fibrous tissue, *g s*, gland-spaces, dilated; *c g*, corkscrew gland (McConnell and J. C. Hirst)

The treatment is hysterectomy. The prognosis is fairly good Of 17 cases, 8 had no recurrence (Gessner).

Endothelioma of the corpus uteri is the rarest of all uterine growths. A few only are recorded.[1] The clinical features indicate a malignant growth of the carcinomatous type originating in the endothelium of the lymph-spaces. The treatment is hysterectomy. The condition has more pathological than clinical interest. From the latter point of view it must be regarded as a cancer.

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[1] Grafe, "Ein Fall von Endothelsarcom des Uterus," Diss., Greifswald, 1897. Pick, "Arch f. Gyn.," Bd. xlix, p 1

Myxomatous polyps of the corporeal endometrium are of frequent occurrence. They are an accompaniment and a local exaggeration of hyperplastic glandular endometritis. The symptoms are the same as in the latter disease except that the metrorrhagia is exaggerated. The same treatment is indicated, but it must be remembered that the curet may slip over the growth and the result of the treatment be a failure. It should therefore be an invariable rule of practice to follow every curettage for metrorrhagia by an exploration of the uterine cavity with a forceps, such as the Emmet curetment forceps. Metroscopy, or the inspection of the uterine cavity through an endoscope, has not yet proved a success. Digital exploration of the uterine cavity is often inconvenient or impracticable, and is not so certain as the skilful use of the forceps. Time and again the author has removed with the latter mucous polyps and fragments of chorion that curets of different sizes and shapes (Sims' and Martin's) had passed over in repeated scrapings of the endometrium.

Mucous polyps of the endometrium may undergo telangiectatic, cystic, mucous, carcinomatous, and sarcomatous degeneration They should always be subjected to microscopical examination after removal.

Menstruation.—Menstruation is the periodic discharge of a sanguineous fluid from the mucosa of the uterus and perhaps from that of the Fallopian tubes,[1] occurring during the time of a woman's sexual activity, from puberty until the menopause. Since the earliest ages of medical literature many theories have been advanced to account for menstruation. The oldest explanation, entertained until comparatively recent times, was founded upon woman's supposed uncleanliness. Menstruation was thought to be an effort on the part of nature to rid the woman's body of noxious humors.[2] Later, it was explained that woman was plethoric and that nature provided a periodic vent for her superfluous blood In modern times Pfluger has advanced the theory that menstruation occurs in consequence of a congestion brought about as follows: A Graafian follicle by its growth finally produces so great a reflex irritation as to determine a local congestion, which manifests itself in a bloody discharge from the uterine mucous membrane. Sigismund, Löwenhardt, and Reichert propounded the doctrine that menstruation occurs because the ovum discharged prior to the menstrual period is not impregnated; consequently, failing this stimulus to further growth and development, a retrograde change with bleeding occurs in the uterine mucous membrane. If one accepts this theory, it is not the ovum from the last period, but that discharged at the time of the first absent period, which is impregnated As a matter of fact, the cause of menstruation is one of the many life-phenomena at present beyond human comprehension. All that can be said is that a nervous influence proceeds periodically from the sympathetic ganglia in the lower abdomen and pelvis, stimulating and congesting the sexual organs. We can no more account for this nervous action than we can explain the nervous force which continues respiration from the moment of birth until death Certain facts from comparative physiology, however, throw a glimmer of light upon the subject. For instance, it is asserted that if sheep fall into heat and are not gratified, the rut returns in a month. Menstruation in the female is obviously what rut is in the lower animals, and the bloody discharges from human females are probably the result of their erect posture and the pelvic congestion which is a consequence of it

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[1] There is always some mucous secretion from the tubes during menstruation, but it is not always bloody.

[2] Many popular superstitions are founded upon this idea; for example, that a drop of menstrual blood withers a flower, and that a menstruating woman in a dairy turns the milk sour The modern physician is still influenced by this old superstition, if the author may judge from grave discussions he has heard as to the propriety of allowing a menstruating nurse to be present during the performance of an abdominal section.

The mechanism of menstruation is better understood than its causes. It is mainly a diapedesis of blood through delicate, newly formed capillaries in a thickened and congested endometrium, the provision for carrying blood to the membrane being better than that for bearing it away by the efferent vessels. Some of the newly formed delicate-walled capillaries no doubt rupture Leopold has given the following description of the uterine mucous membrane during menstruation: The mucous membrane is 8 millimeters (0 315 inch) thick, swollen, dark brownish-red, soft almost to liquefaction, but perfectly intact and separated by a sharply defined boundary-line from the paler muscular tissue of the uterus. The uterine glands, 0.5 to 0 75 millimeter (0.0197 to 0 0296 inch) wide, are considerably lengthened and can be seen by the naked eye. In the superficial portion of the mucous membrane, which is very well preserved and only in certain spots lacks its epithelium and subjacent cells, may be seen an immense and enormously hypertrophied capillary network, the vessels of which have irregular outlines and lie in the uppermost layer of the mucous membrane.

Gebhard[1] gives the following results of his studies. There are three stages. (1) Premenstrual congestion, in which the capillaries are distended; there is a transudation or exudation of blood into the intercellular tissue, the meshes of which are widened, and an accumulation of blood under the surface epithelium, which is raised into little hillocks by the subepithelial hematomata (2) Escape of the accumulated blood through the interstices between the epithelial cells which are pushed apart and some of which may be carried away by the blood as it forces its way out. There is also some desquamation of the glandular epithelium. (3) Post-menstrual involution. The mucosa shrinks. The extravasated blood remaining in the intercellular tissue is absorbed. The surface epithelium lifted away from its subjacent attachments by the interstitial hemorrhage sinks again to its normal level and adheres again to subjacent structures.

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[1] Veit's "Handbuch der Gyn.," vol. iii.

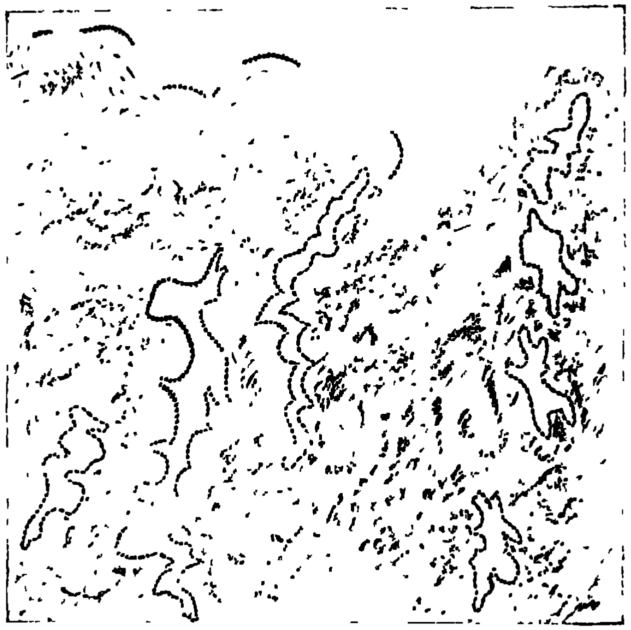

Fig 362.—Postmenstrual regeneration of uterine mucous membrane (Gebhard)

From these observations of Leopold and Gebhard, and from other studies of mucous membrane removed by the curet during menstruation and observed in recently extirpated uteri, it appears that the theory of hemorrhage in consequence of degeneration of the mucous membrane is untenable.

The uterus is increased in size and softened in consistency, these changes being most marked just before the flow appears. The uterine cavity is enlarged, the cervix is slightly dilated, and the cervical glands secrete an increased amount of mucus. The tubes and ovaries are swollen, heavy, and congested There are certain clinical phenomena of menstruation which must often be taken into account by the physician.

Time of First Occurrence and Cessation.—The onset of menstruation is influenced by race, climate, mode of life, heredity, and genital sense. In temperate climates and in the home of the Teutonic and Anglo-Saxon races, menstruation occurs oftener in the fifteenth than in any other year. In these same races transplanted to the eastern middle seaboard of the United States, menstruation appears a year or two earlier.

In Hungary, the three races, Slavonic, Magyar, and Jewish, living side by side in the same climate, begin to menstruate, respectively, at sixteen, fifteen, and thirteen years of age. Hindu girls of Calcutta and negresses of Jamaica, living in similar climatic conditions, begin to menstruate at the eleventh and at the fifteenth year. Climate, however, may influence the onset of menstruation. Puberty is seen earliest in hot, latest in cold climates. It appears at eighteen years in the girls of Lapland and at ten years in Egypt and Sierra Leone.[1] Altitude is also a factor to be considered. Menstruation appears earlier in the lowlands than in the highlands

The social conditions of a girl determine, to a certain extent, the age at which menstruation begins If she lives in a city, subjected, perhaps, to indiscriminate association with the other sex and to sexual temptations, the function appears earlier than it does in the country, or in a girl carefully brought up in comparative seclusion The same rule applies to lower animals. If a bull is admitted to the pasture of a herd of heifers, heat appears earlier in the latter than it would if they were segregated The girls of the leisure or wealthy classes begin to menstruate much earlier than those of the working classes.

It is a matter of common observation that peculiarities of menstruation run in certain families Thus, through several generations of females menstruation appears late and ends early, or *vice versâ.* By genital sense is meant the strength of sexual feeling. In women of strong sexual passion the function of menstruation is commonly instituted earlier and lasts to a greater age than common. Precocious menstruation is not uncommonly associated with nymphomania.

Menstrual Molimina.—By this term is meant the local and reflex subjective symptoms of menstruation. There is a feeling of weight and heaviness in the pelvic organs, due to their congestion and increased size. There is a general nervous excitation, so that women disposed to hysteria and epilepsy exhibit outbreaks at this and perhaps at no other time. The uterus undergoes rhythmical contractions which may be painful. The breasts swell and may secrete milk. There may be intense pain in the mammary glands before the menstrual flow appears. There is a disposition to salivation, which may be pathologically exaggerated. The thyroid gland is enlarged, and the tonsils, epiglottis, and vocal cords are swollen, so that singers may have a tone less clear and true than at other times. The turbinated bones and the mucous membrane of the nasal septum swell. There is increased vascular tension, increased activity of the heart, shown by sphygmographic tracings, and the pulse is accelerated. The temperature is elevated by 0.5° C. The skin is more vascular and shows unusual pigmentation, especially in the dark rings under the eyes. There is increased sweat and an increase of the secretion of the sebaceous glands, especially those of the external genitals. Desquamation of the lingual epithelium and ptyalism have been noted, also a secretion of intestinal mucus with diarrhea. In some women herpes is a constant accompaniment of menstruation. v. Ott has demonstrated a regularly recurring wave in all the physiological processes of women, shown by heat production, muscular strength, lung capacity, force of inspiration and expiration, and tendon reflexes. The greatest activity is manifested just before the appearance of the flow, when there is a sudden subsidence.

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[1] Engelmann shows that this is by no means an invariable rule. In some of the most northerly of Esquimau tribes puberty appears as early as in the tropics ("American Gynecology," March, 1903).

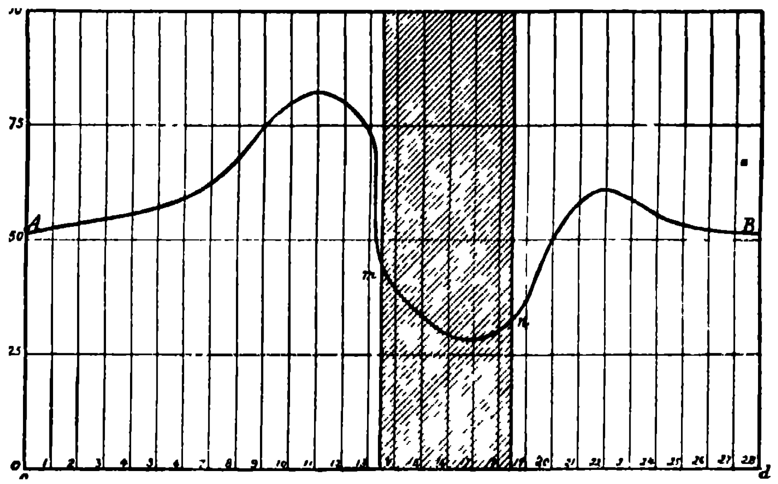

Fig. 363.—Line *A B* indicates the variations in the physiological processes in menstruating women, the abscissa line *c d* indicates the days of the month, *m n*, the menstrual period, the ordinate line *c e* indicates the activity of the physiological processes (v. Ott).

The Character of the Flow.—The discharge consists, in great part, of blood which is more watery than ordinary venous blood. It is mixed with cervical mucus and is alkaline in reaction. It contains, besides the blood and its corpuscles, mucous secretion from the glands along the genital canal, and squamous and columnar epithelial cells, detritus, and micro-organisms of various sorts. It is dark in color, and should not clot It has a peculiar odor from the secretions of the sebaceous glands at the vaginal outlet, excited, as are all the structures of the genital canal, to unusual activity.

The Duration of the Flow.—Menstruation rarely lasts less than three days; the average duration is four or five days; a continuance of seven days, if the natural and invariable habit of the individual, may indicate nothing pathological. In the first two or three days the greatest amount of blood is lost. After that the discharge grows less until it ceases. A leukorrhea or mucous discharge for a day or two preceding and after the cessation of the bloody flow is common.

The Interval between the Menstrual Discharges.—In 70 per cent. of women there is an interval of twenty-eight days from the first day of a menstruation to the first day of the next. The interval is thirty days in 13.7 per cent, twenty-one days in 1.6 per cent, twenty-seven days in 1 4 per cent. (Krieger).

The Quantity of the Flow.—The actual quantity of discharge during menstruation has been estimated at four to six ounces. It is not practicable for the physician, however, accurately to measure the amount of flow He must estimate it by the number of napkins worn in twenty-four hours. If a woman is obliged to change her napkins during the height of the flow more than three times a day, or to wear them double, the quantity of the flow is excessive.

The Cessation of the Flow.—The menstrual flow ceases usually in the forty-fifth year, becoming infrequent and scanty over a period of six, nine, or twelve months, until it stops altogether. There are exceptions, however, to this rule. A woman who begins to menstruate much later than the fifteenth year will often have the menopause before forty. Or, if she begins to menstruate early, she may continue beyond the forty-fifth year. A menorrhagia may precede the menopause. An unusually free discharge may be the last that the patient experiences. There is a sudden cessation of menstruation

As a rule it may be stated that a woman menstruates from about her fourteenth to her forty-fifth year. Precocious menstruation, however, has been recorded in the infant of one to two years old, and the discharge has continued to the sixty-fifth and even to the eightieth year. The menopause exceptionally occurs from the twenty-ninth to the thirty-fifth year. It is seen earlier in hot than in temperate climates.

The clinical phenomena of the menopause are mainly due to vasomotor disturbances; the flashes of heat, tendency to sweats, palpitation of the heart, headaches, neurasthenia, and hysteria, are the chief symptoms. The atrophic changes in the genital organs are marked. The uterus shrinks, the muscular tissue disappears, the uterine cavity is shortened or even obliterated, the mucosa is thin, the epithelial elements atrophy, the glands are reduced in number. The vaginal portion of the cervix is small, and no longer projects from the vaginal vaults; the vagina is shortened, narrowed, and its walls lose their elasticity. The fat disappears from the vulva, the labia majora are flabby, the labia minora shrink, the mons veneris loses its prominence, the pubic hairs turn gray; the ovaries shrink and become cirrhotic; the blood-vessels undergo hyaline degeneration, and the Graafian follicles disappear.

The Connection between Ovulation and Menstruation.—Neither one of these functions is dependent upon the other, but they both depend upon a common cause—the periodic nervous excitation and congestion due to an impulse from the sympathetic nervous system. Dependent as they are upon the same cause, their occurrence is usually synchronous; that is, the ovule is discharged at the height of menstrual congestion. But this is by no means the invariable rule. Leopold,[1] in an examination of twenty-nine pairs of ovaries removed on successive days up to the thirty-fifth after a menstrual period, found a Graafian follicle bursting on the eighth, twelfth, fifteenth, sixteenth, eighteenth, twentieth, and thirty-fifth days after the menstrual period. In other words, ovulation may occur without menstruation at any time in the intermenstrual interval. In five cases there was no ovulation at the menstrual period, or menstruation occurred without ovulation Many examples might be given, from clinical observation, of the mutual independence of these two functions. The common occurrence of impregnation during lactation is a good instance of ovulation without menstruation.[2] Menstruation after oophorectomy and during the first three months of pregnancy occurs without ovulation. I attended in her first childbirth a young woman twenty-two years old who had never menstruated. She had obviously, however, ovulated In the child-marriages of India impregnation has been known to precede menstruation. Renondin saw pregnancy and labor in a woman sixty-one years old, who had ceased to menstruate twelve years before. Repeated ovulation without menstruation is seen also in those curious cases of postmarital amenorrhea, lasting for years. The wife of a physician among my acquaintances menstruated once after marriage; in the following fifteen years she bore ten children without ever menstruating. Three years after the birth of the last child, or eighteen years since its cessation, menstruation returned copiously and regularly, but more frequently than normal, for twelve years. The menopause then began, at the age of forty-eight.[1] A recent ovulation has been observed in an extra-uterine pregnancy of three months' duration (Slavyansky). Coitus four days postpartum has resulted in impregnation (Kronig).

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[1] "Arch f Gyn," Bd xxix, S 347

[2] Remfry ("Revue internationale de Médecine et de la Chirurgie," 1896, No 5) has found by an investigation among 900 nursing women that in 57 per cent only did there occur an absolute amenorrhea Menstruation was regular in 20 per cent. and irregular in 43 per cent. It was also common for conception to occur during lactation, 60 per cent of the menstruating women conceiving. Among the non-menstruating women but 6 per cent. conceived during lactation.

It is necessary occasionally to remove the ovaries in cases of ill-developed, infantile wombs, associated with well-developed ovaries in which there is a violent exaggeration of the menstrual molimina every month without a discharge of blood and the consequent relief of menstrual congestion. The ovaries are found, after their removal, to be filled with well-developed Graafian follicles and numerous depressions representing corpora lutea. In these ovaries there may be a corpus luteum that would answer for an illustration of the yellow body of pregnancy. It may also be necessary to remove the ovaries that have been left behind in a hysterectomy. The menstrual molimina due to ovulation without menstruation may be so severe as to cause unendurable symptoms with perhaps hysterical convulsions

Apparently the cessation of ovulation determines the cessation of menstruation. The vast majority of women who have been subjected to a complete oophorectomy cease to menstruate, and therefore it appears that the ovaries dominate the function of menstruation, but an explanation may be found in the destruction of the sympathetic nerves running in the broad ligament to the uterus. A case is recorded of the cessation of menstruation upon the rupture of an intraligamentary pregnancy with disintegration of the broad ligament, though the ovary was unaffected.

The Medical Management of Puberty, Menstruation, and the Menopause.—A physician's advice is not often sought unless there is something pathological in these phenomena. Nevertheless, a word of warning may often be of service about the guarded information a mother should give her daughter so that she shall not be frightened by the first appearance of the menstrual bleeding and about the prudence that should be observed during menstruation. The disastrous effects of dancing, bathing, catching cold, strenuous mental or physical effort during the periods, and the possible life-long invalidism that may result should be pointed out. The disturbances of the menopause often demand the physician's attention. They are productive of so much discomfort, are so often exaggerated beyond physiological limits, and may last so long that the patient is impelled to seek relief.

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[1] Similar cases are reported in "Amer. Jour. of Obstet.," 1892, p. 352, and "N. Y Med Record," 1893, p 717.

Freedom from care, relaxation of physical and mental effort, regular periods of complete rest once or twice a day, a reduction of the diet, and regulation of the bowels should be the first principles of treatment. Bromids[1] and other nerve sedatives should be administered sparingly and reserved for aggravated exacerbations of the nervous disturbances. The exhibition of ovarian extract from time to time in decreasing doses seems logical It is difficult to judge of its efficacy, as the natural tendency is toward improvement, which may or may not be hastened by the remedy

Amenorrhea, or the absence of menstruation, is physiological before puberty, after the menopause, during pregnancy and lactation. At other times it is pathological.

The *causes* are numerous. There may a periodic discharge of blood from the uterine and tubal mucosa, but it may not escape externally owing to an atresia of the genital canal The uterus may be arrested in development, atrophied or superinvoluted, so that there may be menstrual molimina and ovulation, but no discharge of blood. The uterine cavity may be obliterated by adhesive inflammation after a curettage or labor. There may be ill development or absence of the internal genitalia, in which case there is neither menstruation nor molimina If the ovaries are ill developed or destroyed as egg-producing organs by disease, menstruation ceases. Amenorrhea is not infrequently noted with ovarian cysts and fibroid tumors, especially if the latter are subperitoneal. Amenorrhea may be noted in normal sexual organs as the result of psychical disturbances: dread of illegitimate impregnation; neurasthenia and hysteria; strenuous mental effort, as in the ambitious school-girl, ardent desire for maternity or a belief that conception has occurred; and sudden fright. Change of climate is a common cause of amenorrhea. A large proportion of the Irish girls who emigrate to America miss their sickness for months until they are acclimated A change of residence from the country to the city sometimes has the same effect, and so has a change of occupation, especially from an open-air life to a sedentary indoor existence. Catching cold during menstruation, sea-bathing, cold-water baths or douches, and wet feet often suddenly check the flow (*suppresio mensium*), and subsequent periods for some time afterward may pass without a discharge.

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[1] Sodii bromid., gr. x, and ʒij of elixir of the valerianate of ammonium is a useful routine prescription.

Many diseases of the general system or of organs and structures remote from or unconnected with the sexual apparatus are associated with amenorrhea. Hypertrophic rhinitis has been known to bear a causal relation to it. Obesity, especially if rapidly developed toward middle age, is often a cause.

Chlorosis is the commonest cause among the constitutional diseases. If it does not produce an actual amenorrhea in young girls, the discharge is thin, watery, and scanty. Acute and chronic anemia, leukemia, impaired nutrition, convalescence from the acute infectious fevers, such as typhoid and scarlet fever, chronic nephritis and diabetes, myxedema, akromegaly, Addison's disease, may all determine a cessation of menstruation.

The association of tuberculosis and amenorrhea is recognized by the laity. There is a widespread belief that cessation of menstruation is the precursor of a decline, cause and effect being transposed in the popular mind. As a matter of fact, the primary stages of phthisis are usually associated with menorrhagia. The amenorrhea is a later manifestation.

Drunkenness, opium and other drug habits, and saturnism may check the menstrual discharge.

Finally, amenorrhea may develop in a perfectly healthy young woman without ascertainable cause and may continue for months and years without other symptoms than the anxiety that her peculiarity excites in herself and her nearest relatives.

The symptoms of amenorrhea may be nothing but the absence of the discharge. In gynatresia the uterine cramps and molimina increase in severity with each period. In chlorosis, the scanty periodic mucous discharge may be accompanied with much local pain and is usually associated with obstinate constipation. The most serious general symptoms of amenorrhea are the psychical: hysteria, melancholia, and even a species of dementia have been noted, disappearing on the reappearance of menstruation. Severe diseases and functional disturbances of the eye are recorded with amenorrhea, only amenable to treatment after the re-establishment of the function.

The treatment of amenorrhea should obviously be directed to the cause and must vary greatly in individual cases. Gynatresia indicates the removal of the obstacle to the escape of the discharge. Grave defects of development, destructive diseases of the genitalia are incurable. Psychical causes demand appropriate treatment; the rest cure is indicated for hysteria and neurasthenia. The woman who fears impregnation or believes it has occurred begins to menstruate if her fears are allayed or she is convinced of her error.

The overworked school-girl should be taken from school to a healthy life in the open air.[1] The amenorrhea from change of climate or occupation disappears when the individual is accustomed to her new environment. The cessation of menstruation from exposure to cold is usually cured in time, if further imprudence is avoided. Constitutional diseases, if curable, should be treated without reference to the menstrual function, which will be restored as the general health is improved. Chlorosis requires good hygiene, the persistent use of blood tonics, the improvement of the digestion, and the correction of the constipation. Pyrophosphate of iron (gr. v) dissolved in malt extract is a good routine prescription. Blaud's pills, pepto-mangan, bone-marrow, and other modern remedies for the improvement of the constitution of the blood, such as the peptonates and albuminates of iron, may be alternated with the pyrophosphate. If no cause can be discovered for the amenorrhea; if the general health is good, if there are no local or general symptoms, and if the absence of menstruation excites no alarm or anxiety in the patient, treatment is uncalled for.

Nothing is more illogical than the common practice of continually prescribing an emmenagogue or resorting to local treatment for the cure of amenorrhea. Medicinal emmenagogues, however, and electricity or irritating applications to the endometrium may be required, if systemic treatment and hygienic management fail, or if the cause of the amenorrhea is an ill-developed uterus or one in the early stages of atrophy or subinvolution.

The best medicinal emmenagogues are oxalic acid, gr. ¼, in syrup of lemon and water, ad f℥ss, four times a day, the salicylates; permanganate of potassium, gr. i–ij, t. i. d.; aloes, pearls of apiolin, and binoxid of manganese (gr. ij). Dewees' famous emmenagogue mixture is:

Tinct. ferri chlorid	6 parts.
Tinct. cantharides	2 "
Tinct. aloes	8 "
Ammoniated guaiac	24 "
Simple syrup	58 "

The irritation of the endometrium by the introduction of the sound and the application of iodin has brought on menstruation The best local application is indisputably the electrical current—either galvanism 15–40 milliampères, the *negative* pole being inserted in the uterus, or the faradic current by a bipolar electrode *in utero*. The latter is best adapted to cases of ill-developed, atrophic, and subinvoluted uteri; it should be applied systematically and regularly over a considerable space of time. The former is indicated before the time of the expected period. Measures to induce a congestion of the pelvis are sometimes effectual. Warm foot- and sitz-baths and horse-back riding are the best

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[1] The ideal school for girls or college for young women should be conducted with an eye to the individual scholar. Her studies should be lightened at her periods. The Podsnapian plan of ignoring the function of menstruation as an indelicate subject is too often responsible for the acquisition of a more or less superficial mental culture at the expense of chronic invalidism and a diminished capacity for maternity.

Vicarious menstruation is the periodic discharge of blood from some other mucous surface than that of the uterine cavity.

The nasal mucous membrane is the commonest source of vicarious menstruation.[1] It may occur at any age: Cases are reported of precocious monthly discharges in infancy; of menstruation beginning as a periodic epistaxis for a few months until the uterine discharge was established, of a regular monthly discharge from the nose from the thirteenth to the forty-first year. Vicarious menstruation may cease when the woman becomes pregnant and recur after the convalescence, just as a normal menstruation should do. The next most common source of vicarious menstruation is the lungs The trachea, larynx, stomach, the ear, the eyes, and the thyroid gland (through a fistula) are other sources Hancock[2] has reported a case of bleeding from the left breast preceding each period In the author's service in the Howard Hospital a neurasthenic young woman had vicarious menstruation from the rectum, with severe molimina.

The treatment of vicarious menstruation is to establish a flow from the uterus by the measures recommended for amenorrhea.

Menorrhagia is an increased or prolonged menstrual discharge It has many causes; hyperplastic endometritis is the commonest. Other local diseases manifested by periodic hemorrhages are: chronic metritis; sclerosis of the uterine blood-vessels, tertiary syphilis; polyps and fibroid tumors; malignant disease and tuberculosis; inflammation and neoplasms of the tubes and ovaries. Constitutional diseases causing menorrhagia are anemia and chlorosis in exceptional cases, though amenorrhea is usually a result of these diseases; hemorrhagic diathesis, gout, scurvy, the acute infectious fevers, malaria, influenza, and saturnism The early stages of phthisis are commonly associated with menorrhagia Cirrhosis of the liver, heart disease, and nephritis are also causes. Intestinal parasites have been noted as a cause. The menorrhagia often becomes a metrorrhagia—that is, a continuous bleeding from the womb or hemorrhages at odd times without distinct periodicity.

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[1] The author has seen a case of pelvic peritonitis with intestinal adhesions followed by tympany, amenorrhea, and the subjective signs of pregnancy for nine months. There was a regular monthly discharge of blood from the nose.

[2] "Med. News," 1895.

The treatment may be medicinal (ergotin, hydrastinin, stypticin, suprarenal extract), but should usually be a curettage and a careful exploration of the uterine cavity to detect a polyp or other neoplasm. The positive pole of a galvanic current (15–40 milliampères) is one of the best hemostatic agents for the endometrium. Intra-uterine applications of iodin or of nitrate of silver solution are at times effective, but they have disadvantages, already pointed out. Since 1898 cauterization of the endometrium by steam has had an extensive vogue in Germany. Free steam is injected in the uterine cavity (*atmokausis*) or the steam circulates through metal tubing without coming in actual contact with the endometrium (*zestokausis*). The cauterization is difficult to regulate, is not entirely safe, predisposes to cervical stenosis or atresia, and may obliterate the uterine cavity. There seems to be little to recommend this treatment in preference to other methods more easily controlled, safer, and quite as efficacious. It might be employed after everything else had failed and before resort to a hysterectomy, which has rarely been required in uncontrollable bleeding near the menopause.[1]

A permanent cure of menorrhagia or metrorrhagia can not be expected unless the cause is removed, if possible, and a treatment of the cause alone is sometimes sufficient to cure the menorrhagia. Thus, the treatment of a chronic malaria has checked excessive menstruation, without any local measures whatever, and the removal of intestinal parasites has had the same result. In obstructed circulation from weak heart, valvular disease, and cirrhosis of the liver, digitalis or strophanthus must be added to the treatment or may be all that is required.

Dysmenorrhea.—Painful menstruation in which the suffering exceeds the usual depression, discomfort in the pelvis and back, and the nervous excitation commonly experienced by all women is one of the commonest gynecological affections demanding the physician's attention. Unfortunately its cure is as puzzling a problem as confronts the clinician.

At one time dysmenorrhea was regarded as indicating simply a mechanical difficulty in the escape of the menstrual blood, and this impression prevails largely to-day. Painful menstruation, however, is by no means such an uncomplicated subject. It may depend upon a hyperesthesia of the endometrium. When the mucosa is infiltrated with blood and the surface epithelium is elevated by extravasation, acute suffering is produced, aggravated by painful contractions of the myometrium and reflex nervous disturbances. It may depend upon an ill development of the uterine blood-vessels which are of insufficient caliber to contain the excess of blood, upon lack of development in the uterus itself, and a deficient capacity of the uterine cavity. It may be mechanical, especially if a narrow cervical canal is still further obstructed by angulation in an acute anteflexion, or if the cervical canal is obstructed by a polyp It may be due to disturbances in the general nervous system without any local disorder at all, and, finally, it may depend upon ovarian or tubal disease. The prolonged recurrence of uterine irritation in cases of dysmenorrhea commonly causes an endometritis by which the symptoms are aggravated. Hence, it is frequently stated that the suffering increases as the girl grows older and that the discharge has become more profuse. The usual position of the uterus in cases of dysmenorrhea is one of exaggerated anteflexion, which is an evidence of ill development and may be a cause of mechanical difficulty. Some of the most aggravated cases, however, are seen with retroversion in unmarried girls, on account, perhaps, of the endometritis and pelvic congestion which are results of the displacement.

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[1] The apparatus for injecting steam into the uterus is made by Hahn u Lochel, Dantzig. See "Encyklopädie der Geb. u. Gyn.," Leipzig, 1900; also, "Atmokausis and Zestokausis," Pincus, Wiesbaden, 1903.

It can readily be understood why marriage and maternity so often cure dysmenorrhea. Coitus and pregnancy stimulate the development of the uterus Labor removes any mechanical obstacle to the escape of the discharge. The exfoliation of the decidua and the evolution of a new endometrium in the puerperium may replace a hyperesthetic with a normal mucosa

The symptoms of dysmenorrhea are pains of a cramp-like nature with exacerbations and remissions in the uterine region, continuing during the first twelve to thirty-six hours of the flow, associated often with nausea and vomiting and with nervous disturbances, reaching in the worst cases to the grade of hysterical convulsions or causing syncope. The suffering may not be localized in the pelvic region at all, but may be manifested in a severe headache or entirely in psychical outbreaks.

In the intermenstrual intervals there is no discomfort, except in some cases a manifestation of intermenstrual pain or "Mittelschmerz." Usually the pain is more severe the greater the quantity of the discharge. It is not uncommon, however, in cases of ill-developed uteri, to obtain a history of severest pain with a scanty discharge, relieved or mitigated if the flow becomes normal in quantity. If the dysmenorrhea depends upon ovarian or tubal disease, the pain is greatest before and after the flow, being relieved during the time of the actual discharge and is localized above one or both groins.

In cases of hyperesthetic endometrium the introduction of a uterine sound and the impact of its point upon the fundal endometrium often elicit the same kind of pain which the patient experiences during menstruation.

The suffering of dysmenorrhea is influenced greatly by the patient's health and the condition of the nervous system. The overworked school-girl removed from her studies and leading a healthy open-air life may be entirely relieved without other treatment

Many young women who suffer severely every month in the trying climate and the feverish social life of American cities are entirely free from pain in their summer outings or during a trip abroad.

Treatment.—There was a time when every case of dysmenorrhea was supposed to indicate a forcible dilatation of the cervix and a curettage. While it is undeniable that these measures are often of the greatest service and should frequently be the starting-point of treatment, the physician who depends upon them alone in every case will subject himself and his patients to many a disappointment.

The neurasthenic woman requires appropriate treatment for her nervous condition and may need nothing else. The young woman under a nervous strain in her occupation or social life with a hyperesthetic endometrium may be cured by a better regulated existence, freedom from care or excitement, and moderate outdoor exercise. Ill-developed uteri with scanty menstruation may require the treatment of chlorosis with abdominal massage and Swedish movements.

A stimulant treatment of the myometrium and of the endometrium by the negative pole of a galvanic current (15–40 milliampères) and by faradism is often of undoubted advantage in such cases, but there are grave objections to local treatment in young unmarried women.

Such an abnormality as retroversion should be corrected, best by the operative treatment in unmarried women, preceded by a dilatation and curettage

A laxative just before the expected period and rest in bed for the first twelve or twenty-four hours of the flow should be recommended in all cases until the course of treatment to effect a permanent cure has been decided upon and carried out

The medicinal relief of the intense suffering of dysmenorrhea is a problem frequently and urgently presented to the physician, but is one often most difficult of solution A hypodermic of morphia relieves the pain most quickly and effectually, but there is great danger by its use every month of establishing the opium habit. Antipyrin, phenacetin, and acetanilid are often of service. Acetanilid (gr. ij) with carbonate of ammonia (gr. iij) every hour for three doses is as effectual as any single remedy except morphia. Apiol is usually disappointing. Bromid of sodium (gr. v) and elixir of valerianate of ammonium (fʒij) every four hours are of service, combined with the acetanilid and carbonate of ammonium. Fluid extract of viburnum prunifolium (fʒj), diluted, every three hours, may prove a useful adjuvant of other treatment. The Germans recommend scarification of the cervix and local bloodletting just before the period, but frequently repeated local treatments are not to be recommended in young women.

The tubal or ovarian forms of dysmenorrhea can as a rule only be cured by operative treatment.

Membranous dysmenorrhea or exfoliative endometritis is characterized by the expulsion of a fibrinous cast of the uterine cavity or of the superficial portion of the mucosa at the menstrual period, accompanied usually, but not always, with severe pain. There is no fever, but often a pronounced malaise for some days after the flow. During this time there is frequently a profuse leukorrhea. The discharge of membrane may occur regularly with every period or only at intervals of three or four months. The discharged membrane may be a complete sac, like the decidua in some cases of extra-uterine pregnancy, but it is more likely to be expelled in several pieces. It may be 1 to 3 millimeters thick. The microscopical examination always shows an interstitial endometritis, with a development of the interglandular cells to a degree that suggests the decidual cells of pregnancy, but there is not the same increase in the amount of protoplasm nor the universal presence of these cells that is characteristic of the mucosa of gestation. The superficial epithelium is preserved in places or is wanting entirely. The glands, few in number, run an irregular course. The tissue does not stain well and suggests some degree of maceration, which has no doubt occurred in the time intervening between its detachment and expulsion from the uterus (Gebhard) The microscopical changes found in the discharged membrane may not be discoverable in the mucous membrane removed by the curet in the intermenstrual intervals. The inflammatory process, therefore, recurs at each period and subsides in the interval.[1]

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[1] Kollmann ("Munch. med Wochenschr," 1901, No 37) denies that there is a uniform histology of membranous dysmenorrhea, the membrane in his investigations being sometimes normal, sometimes showing interstitial or glandular hypertrophy, round-cell infiltration, or fibrinous exudate

Endometritis, heredity, imprudence during the periods, have been described as the causes of membranous dysmenorrhea. The majority of the cases are inexplicable. In twenty-seven cases Löhlein[1] found 21 of the women sterile, 6 who had borne children.

Treatment is often of no avail. Curettage and cauterization of the uterine cavity with pure carbolic acid may prove effectual; so may electric cauterization of the endometrium. Improvement of the general health, open-air exercise, change of air and scene may be required

Sterility.—If a woman remains unimpregnated eighteen months after marriage, without taking measures to prevent conception, she may be called sterile. In about 20 per cent. of sterile marriages the fault lies with the male. His spermatozoa should be examined under the microscope and his *potentia cœundi* should be ascertained in every case as part of the routine investigation of the cause of sterility in the female. The causes of sterility in the wife may be classified as follows:

Anatomical or developmental defects preventing normal insemination or presenting mechanical obstacles to the access of the spermatozoa to the ovum Absence or stenosis of the genital tract in whole or in part, absence of the cervical canal and uterine cavity, lack of patency in the tubes, absence or arrested development of the ovaries, are a necessary bar to impregnation. So is an imperforate hymen or atresia of any portion of the genital canal. The commonest developmental anomaly responsible for sterility is stenosis of the cervical canal and a U-shaped anteflexion of the uterus

Diseases, injuries, and displacements of the vulva, such as vaginismus, kraurosis, and neoplasms may prevent normal insemination, and are usually, but not necessarily, a bar to conception, the mere deposition of semen upon the external genitals being followed sometimes by impregnation. An injury of the vulva which the author has twice seen responsible for sterility is a perforation of the fossa navicularis into the rectum at the first coitus, the hymen remaining intact. Subsequent intercourse occurred by way of the fistula

Acquired atresia of the vulva and vagina may prevent impregnation. In a case of the author's, the vagina was reduced by acquired atresia to a narrow sinus throughout its whole length, barely admitting a surgeon's probe. Impregnation occurred by the deposition of semen upon the vulva. Coitus in such cases has not infrequently been practised by the urethra, which has been gradually dilated. With a coincident vesicovaginal fistula above the site of complete atresia impregnation is possible and has occurred. Injury of the pelvic floor, destruction of the perineum, inversion of the vagina, may be causes of sterility by preventing the retention of seminal fluid.

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[1] "Centralbl. f. Gyn.," 1886, p. 465.

Retroversion of the uterus may be, but is by no means necessarily, a cause of sterility. In the supine position the cervix is tilted upward and is not bathed as it should be in the seminal lake occupying the posterior vault of the vagina. The motility of the spermatozoa may overcome the obstacle, but cases of sterility are cured sometimes by a pessary or the operative treatment of retroversion.

A complete prolapse of the uterus usually prevents conception, but in a case of the author's impregnation took place in spite of a total prolapse of years' duration. A fibromyoma or other neoplasm of the uterus or of the endometrium may prevent conception by opposing obstacles to the ascent of the spermatozoa, but the motility of the latter may enable them to surmount barriers mountains high in comparison with their microscopical size and to traverse the most tortuous canal.

The commonest disease of the genitalia accountable for sterility is salpingitis with closure of the abdominal ostium by adhesive inflammation. The common cases of "one-child sterility" are usually due to this cause, and it also explains the infrequency of conception in prostitutes. Diseases and neoplasms of the ovaries destroying them as egg-producing glands, their inclosure in an adventitia of inflammatory exudate, and a thickening of the proper capsule prevent ovulation and therefore preclude conception.

Anemia and wasting diseases may deprive the Graafian follicles of the blood required for their maturation and rupture and so may prevent ovulation.

The Psychic Causes of Sterility.—It is true that women may be impregnated while asleep, drunk, asphyxiated, or unconscious from any cause; by the mere deposition of semen upon the external genitalia; by the artificial injection of seminal fluid into the genitalia; without ever experiencing the least sexual sensation Nevertheless, a lack of affinity between the man and woman, an absence of sexual passion, and of an orgasm, may account for sterility.

Treatment.—It is obvious that the treatment must be directed to the cause and must vary greatly in individual cases. A careful study of the patient should naturally precede the treatment. The case may call for the removal of tumors from the vulva, the cure, if possible, of kraurosis, the gradual dilatation of the ***introitus vaginæ***, or cutting the levator ani muscles in vaginismus; the correction of atresia or stenosis in the genital canal; the excision of the hymen and the closure of fistulæ; the repair of vaginal injuries, or the reposition of a displaced uterus. A tonic treatment for anemia may be indicated. Most frequently a forcible dilatation of the cervical canal and a curettage of the uterus are required. If there is evidence in physical signs or subjective symptoms of tubal disease, a trap-door excision of the tubal walls or a partial exsection of the tube may permit impregnation.

The release of the ovaries from a bed of exudate or false membrane may have the same result. In cases demanding total salpingectomy, pregnancy has followed the implantation of the ovary in the uterine cornu. Experiments upon the lower animals, as well as upon human beings, have demonstrated the feasibility of transplanting the ovary to some other situation than its normal one in the peritoneal cavity, or even of implanting the ovary recently removed from another person with continued functional activity and a subsequent conception.

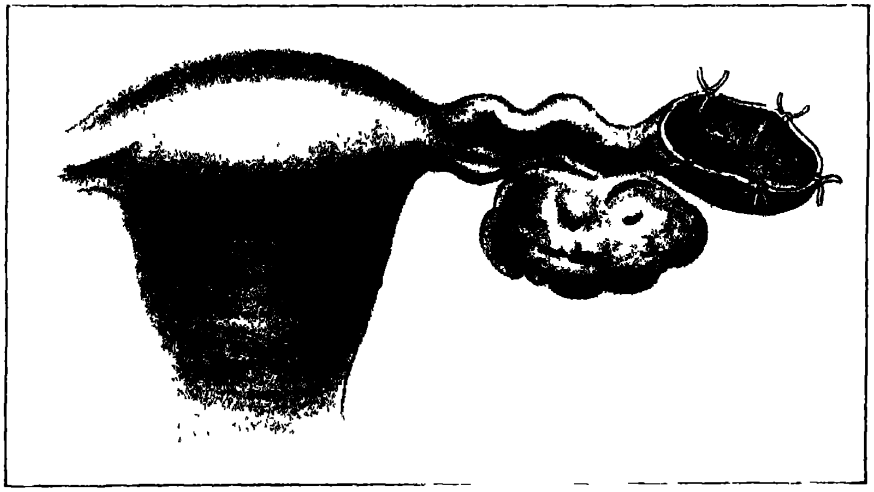

Fig 364 —Excision of tubal wall for sterility from occlusion of the abdominal orifice.

A myomectomy or the removal of any pelvic or abdominal tumor exerting pressure upon the genital canal may remove the obstacle to conception. From their nature many cases are incurable. Occasionally a marriage sterile for many years may inexplicably prove fruitful without special treatment The author has had under his charge in confinement a woman who conceived for the first time after more than twenty years of married life, when she had given up all hope of such an event. The physician should usually be careful not to inform his patient bluntly that she is hopelessly sterile. She should be allowed to entertain some hope of maternity until the lapse of years has reconciled her to the idea that she can not expect offspring.

PART VIII.

THE FALLOPIAN TUBES; EXTRA-UTERINE PREGNANCY.

THE FALLOPIAN TUBES.

THE uterine or Fallopian tubes run from the cornua of the uterus, in the upper edges of the broad ligament, to the ovaries They are divided into the following parts: The uterine ostium, a funnel-shaped opening into the uterine cavity; the intramural or uterine portion running through the uterine wall, the isthmus, the narrow inner third of the free tube, springing from the uterus between the insertions of the round and ovarian ligaments, but at a slightly higher level · the ampulla, the expanded outer two-thirds of the tube; the infundibulum, a funnel-shaped expansion at the end of the tube in the bottom of which is the abdominal ostium and the fimbriæ, surrounding the infundibulum, one of which, the ovarian fimbria, runs to the upper or tubal pole of the ovary, to which it is attached There is a distinct groove along the upper surface of this fimbria, lined with epithelium. The other fimbriæ are usually in contact with the ovary The upper edge of the broad ligament to which the tube is attached or in which it is embedded is called the mesosalpinx.

The Fallopian tube has the following average dimensions.

Length	12.5 cm
Width of the isthmus near the uterus	0.3 "
Greatest width of the ampulla	0.8 "
Length of the isthmus	4.5 "
" " " fimbriæ	1.25 "
" " " ampulla	8.0 "
" " " ovarian fimbria	2.75 "

The tubal walls consist of a mucous, a muscular, and a serous coat The tubal mucosa possesses no glands and no submucosa It has the round cells found in the interglandular substance of the uterine mucosa. It is thrown into longitudinal folds or plications, beginning in the isthmus as slight elevations, but becoming so well marked in the ampulla that the folds reach across the lumen of the tube, giving such a complicated appearance to a transverse section that this portion of the tubal canal is called the labyrinth. The epithelium is ciliated, the cilia lashing toward the uterus. The fimbriæ are clothed on their inner surface with this ciliated epithelium, and the groove of the ovarian fimbria is similarly provided, the epithelium growing beyond the upper edges of the groove, encroaching somewhat upon the serosa of the mesosalpinx, and being continuous with the columnar epithelium covering the ovary.

The muscular coat has three layers: an inner, feebly developed, of longitudinal fibers; a middle, well developed, of circular fibers; and an outer thin layer of longitudinal fibers.

The serous coat has likewise three layers: a subserosa, a tunica adventitia, and a tunica serosa.

The blood-vessels are a terminal branch of the uterine artery, given off just in front of the ovarian ligament and running along the under surface of the tube to anastomose with a branch of the ovarian artery. Veins accompany the arteries The tubal walls themselves are richly supplied with blood-vessels. There is a well-developed venous plexus under the serous coat

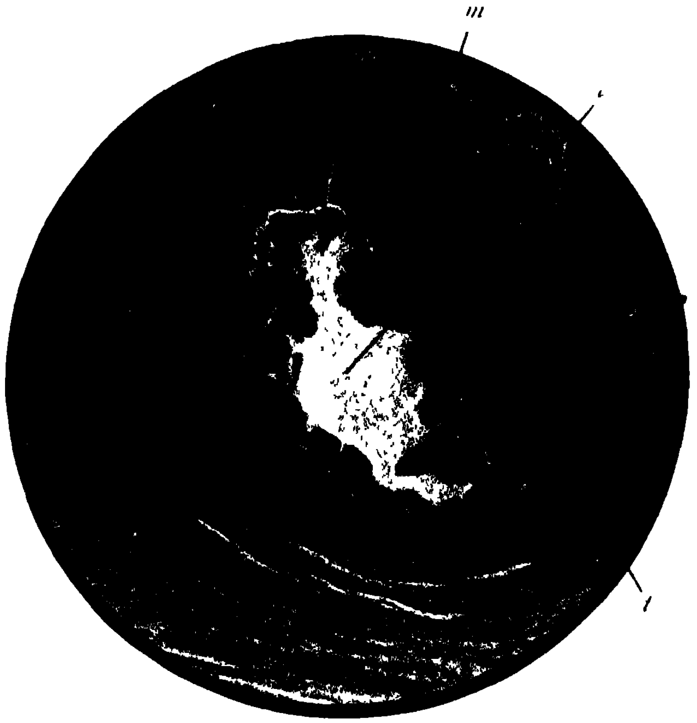

Fig 365 —Normal Fallopian tube, uterine end: *m*, Mucosa, *l*, lumen of canal; *t*, tube-wall (McConnell and J. C. Hirst)

The lymphatics of the tubes are two or three branches running along the upper margin of the broad ligaments, anastomosing with ducts from the uterus, with the plexus at the hilus of the ovary and running to the lumbar glands.

The nerves are derived from the uterovaginal plexus and from that of the ovarian artery. Branches accompany the blood-vessels and form a plexus in the subserosa, from which terminal filaments go to the other coats of the tube.

Dependent usually from the ovarian fimbria is a small cystic body, the hydatid of Morgagni, with a long, slender pedicle. Its wall is connective tissue, its lining membrane a pavement epithelium, sometimes columnar or ciliated, and its contents a clear fluid. It varies in size from that of a pea to that of a hickory nut. Its pedicle may reach a length of 3 centimeters or more It represents the terminal end of the Müllerian ducts.

Diseases of the Tubes.—The tubes may be congested; they may be displaced. They are subject to a variety of inflammations; and they may be the seat of neoplasms.

Congestion of the tubes may be the result of obstructed circulation, of a systemic infection, such as cholera, of external burns, or of phosphorus-poisoning. The circulation is obstructed by torsion, by displacements of the tubes, as in inguinal hernia, and inversion of the uterus, by constricting bands of adhesive lymph, by thrombosis of the spermatic vein, by a passive congestion of all the pelvic organs, or by heart and liver diseases

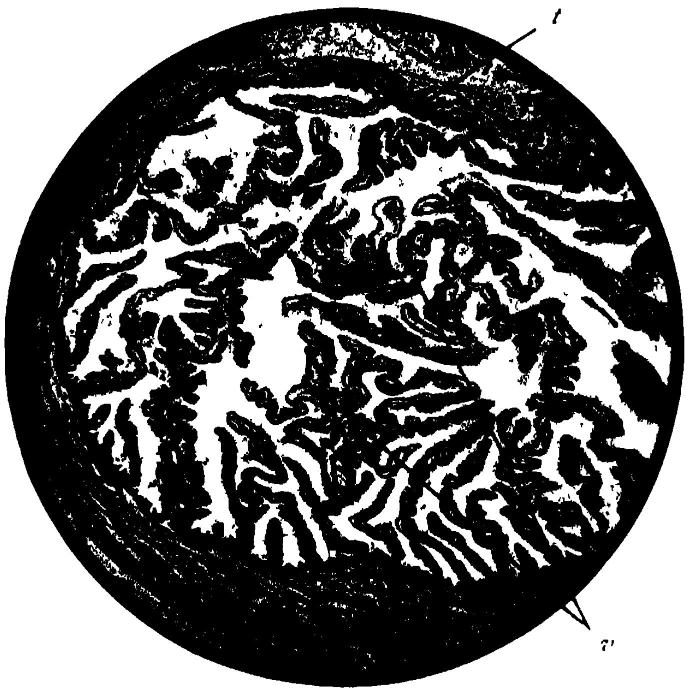

Fig. 366.—Normal Fallopian tube, section near abdominal end *t*, Tubal wall, *v*, villus-like plications (McConnell and J. C. Hirst).

Torsion of the tubes may be so extreme as to sever the tube at its inner third with the corresponding portion of the broad and ovarian ligaments. In the case diagrammatically represented in figure 387 the outer two-thirds of the tube with the ovary were torn loose and lifted out of the abdomen by light traction; there was no hemorrhage; the ovary and tube were necrotic. A case is reported of detachment of the tube and its reattachment in the lumbar region, where it was nourished by a vessel from the aorta.

The congested tube is swollen, dark red in color, and the fimbriæ may appear actually erected. There may be extravasations of blood in the walls, hemorrhages into the lumen, hyaline degeneration of the blood-vessels, necrosis of the mucosa and of the muscularis.

Displacements of the tubes accompany displacements of the uterus; in retroflexion they are necessarily carried downward and backward; in prolapse they may accompany the descent of the uterus; in inversion they lie, partly at least, in the cup formed by the inverted uterus. They are sometimes enormously elongated by intraligamentary cysts, over the top of which they run, reaching a length of 30 centimeters or more.[1] They have been found in inguinal and crural hernias. They may run an oblique course upward and forward to the iliac fossæ, or they may be arrested by adhesions in embryonal life at the level of the kidneys by an attachment of the ovary in that situation and the prevention of its normal descent.[2]

Inflammations of the tubes are non-infectious and infectious The former may be due to cold, injuries, the reflux of irritating substances injected into the uterus, such as iodin, and to the exanthemata. The acute congestion of menstruation may be exaggerated to the degree of inflammation and stagnation of the tubal secretion in consequence of an abnormal tortuosity of the tube may prove a chronic irritant exciting inflammation.

The infectious inflammations, due to the presence of bacteria, are much commoner than the non-infectious Infection of the tubes can occur from the peritoneum, the intestines, the uterus, the blood- and lymph-channels Tuberculosis is a good example of infection of the tube from the peritoneum The bacteria of the bowel gain access from adhesions between a coil of intestine and the tube, or secondarily from the peritoneal cavity. Gonococci most commonly advance along the uterine mucosa, through the uterine ostium to the tubal mucosa, so do colon bacilli and staphylococci. Streptococci usually penetrate the myometrium and make their way to the tubes by way of the lymphatics or blood-channels Anaerobic saprophytes are present in cases of hematosalpinx complicating acquired gynatresia or in any case of retention of putrescible material in the tubes.

The commonest infecting micro-organism in the tube is the gonococcus. In 218 pus-tubes they were found 74 times (Kleinhans). Streptococci are next in frequency; tubercle bacilli next; then follow colon bacilli, staphylococci, diplococci pneumoniæ, and pneumobacilli. It is usually impossible to demonstrate the infecting agent in a pyogenic inflammation of the tubes In 370 pus-tubes examined by Wertheim, Witte, Martin, and Menge, 227 were sterile. The micro-organisms expire by being confined in a narrow space, destroyed by their own secretions and by the compression to which the tubal contents are subjected. The kind of infection can only be inferred from the patient's history and physical signs elsewhere, which may point to gonorrhea or to a puerperal infection, proba-

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[1] Payer reports a tube 76 centimeters long ("Monatsschr f Geburtsh u Gyn.," Bd xiv, p 745).

[2] Busse, "Monatsschr f Geburtsh u Gyn," Bd xiii, H. 6

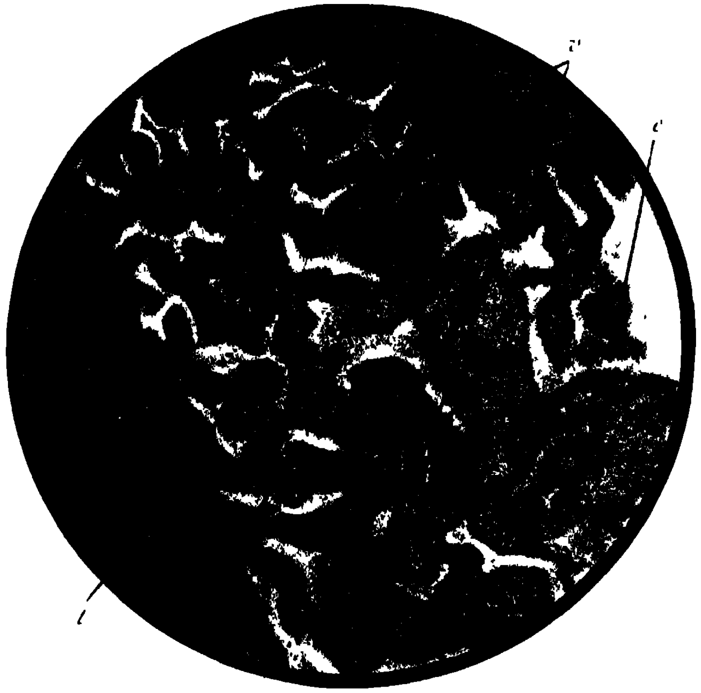

Fig 367 —Acute septic salpingitis, showing the round-cell infiltration · *e*, Exudate; *t*, tube-wall, *v*, villi, infiltrated with round cells (McConnell and J C Hirst)

bly streptococcic. An auto-infection of the tubes is described, but the infectious bacteria must at some time have come from without, usually along the genital canal from gonorrheal infection in coitus or otherwise, from puerperal infection, from the introduction of instruments into the uterus, or from operations upon the genitalia; or possibly from the other sources of tubal infection enumerated, the peritoneum, the bowel, or the lymph- and blood-channels.

Pathological Anatomy.—The mucosa of the tubes exhibits round-cell infiltration, hyperplasia of the mucous folds, agglutination of the apposed surfaces at the terminal expansion of the

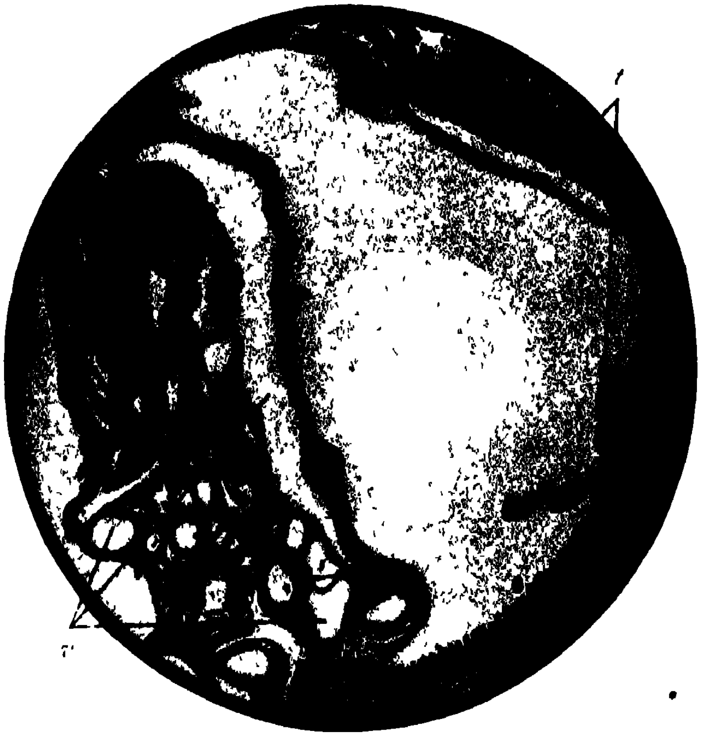

Fig 368.—Pyosalpinx: *t*, Tube-wall, *t'*, pseudoglandular or follicular arrangement, due to adhesions of plications (McConnell and J. C Hirst)

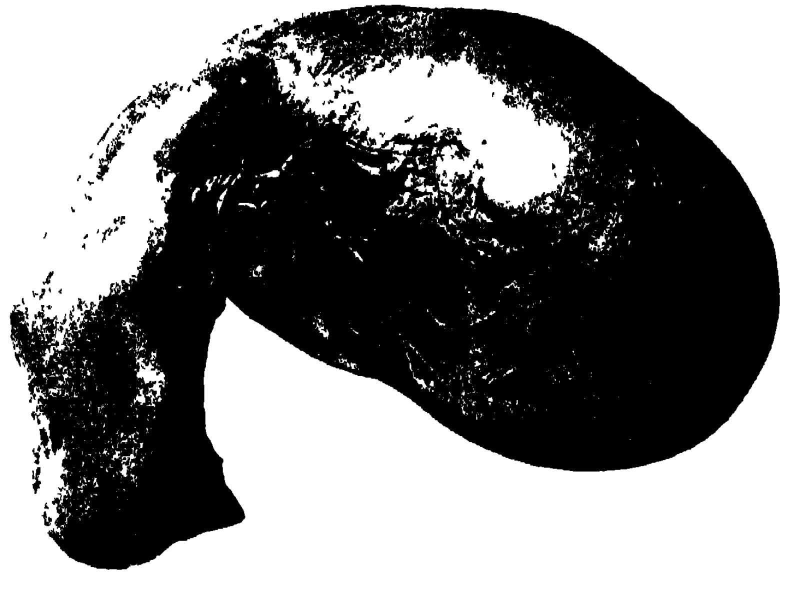

Fig. 369.—Pus-tube.

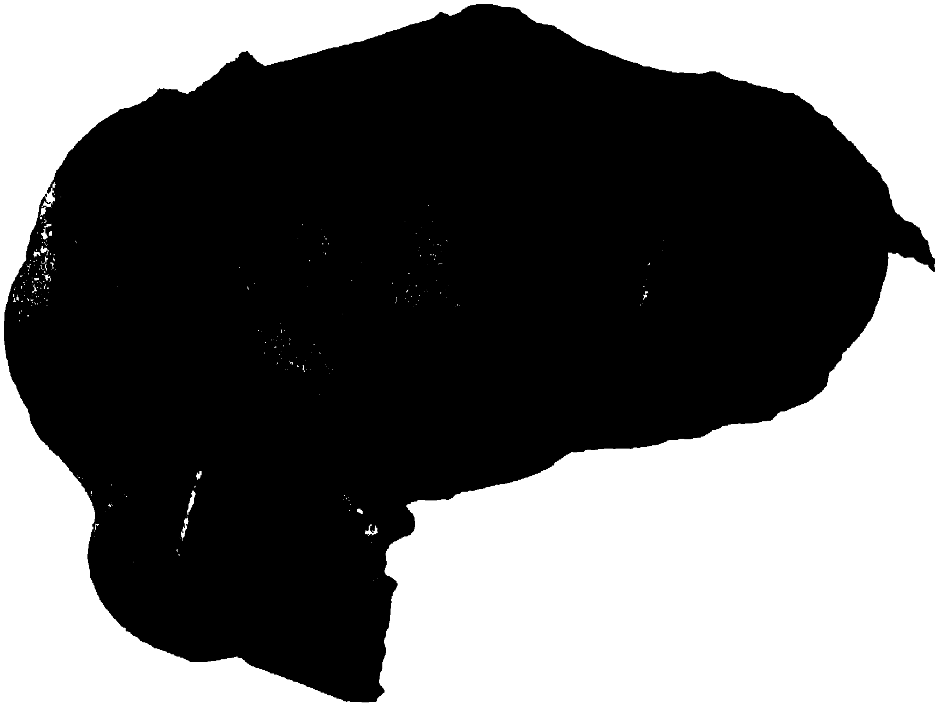

Fig. 370.—Pus-tube.

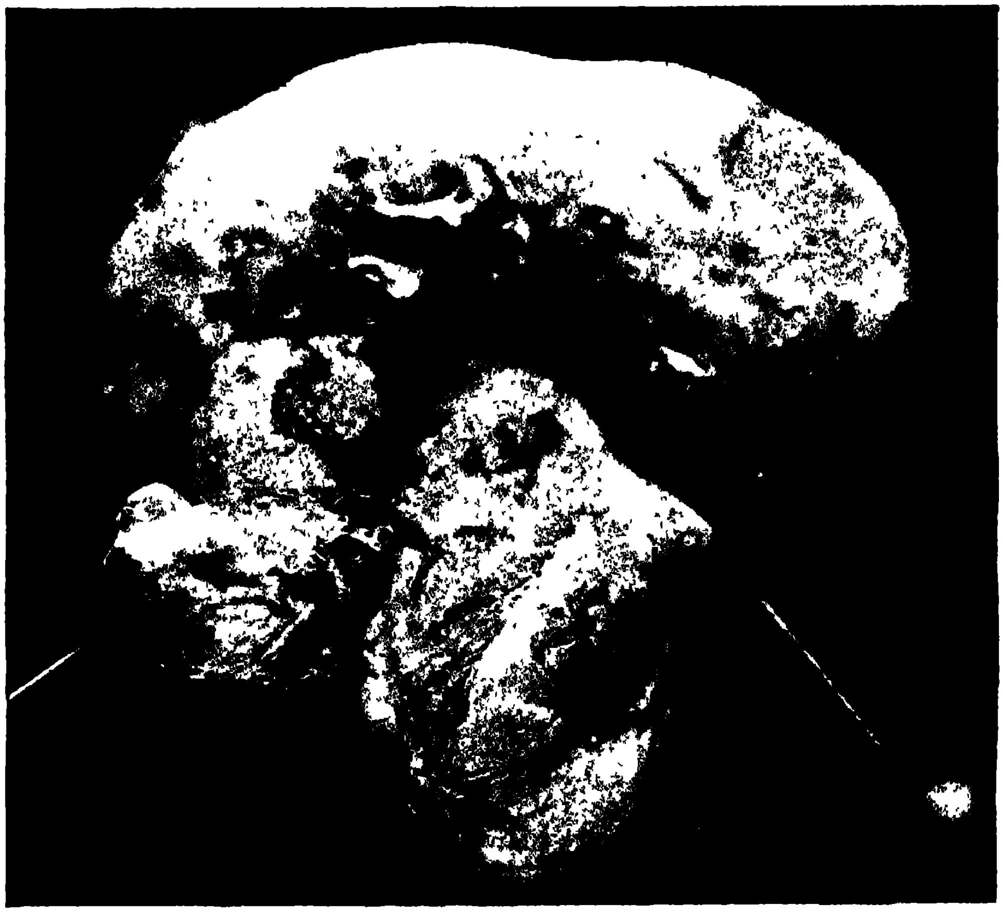

Fig. 371.—Pus-tube.

plications, and the inclosure of cyst spaces beneath (*salpingitis pseudofollicularis cystica*). The ciliated epithelium is long preserved in these deeper spaces, while it may early disappear, being replaced by granulation tissue on the periphery of the plications. There may be such an intimate union of the latter by adhesions that there is no longer a continuous tubal canal. The usual effect of any microbic infection of the tubal mucosa is pus-production This is most commonly the case in gonorrheal infection, but not invariably. The less virulent micro-organisms, such as staphylococci and colon bacilli and any of the others, if they

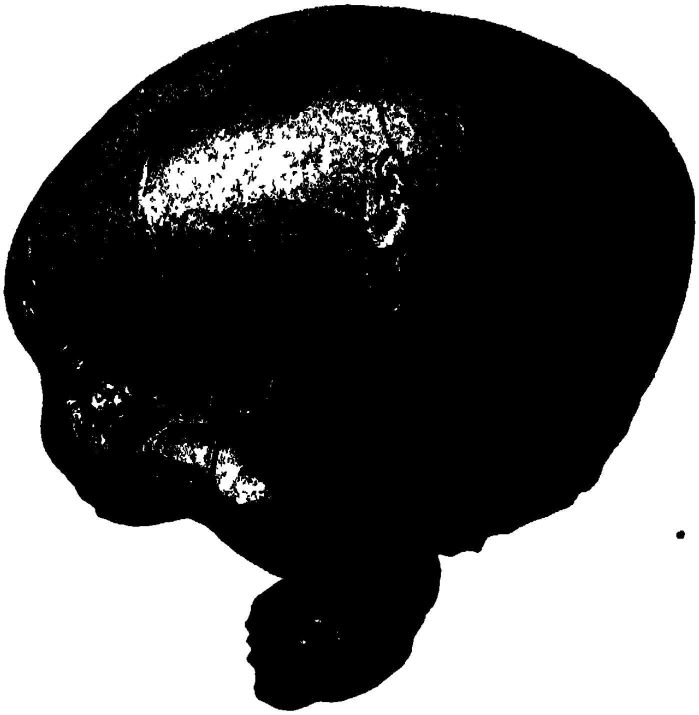

Fig. 372.—Pus tube.

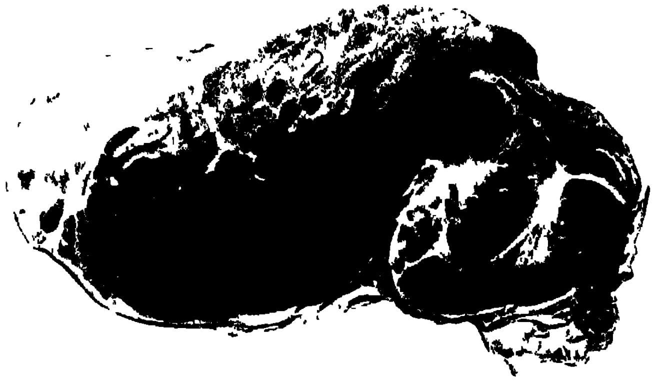

Fig. 373 —Pus-tube, laid open by median longitudinal section.

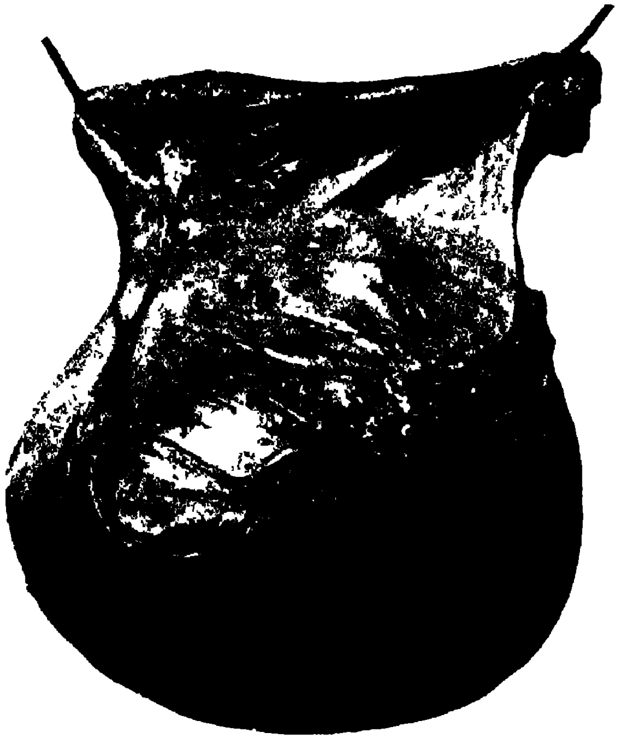

Fig 374 —Tubo ovarian cyst.

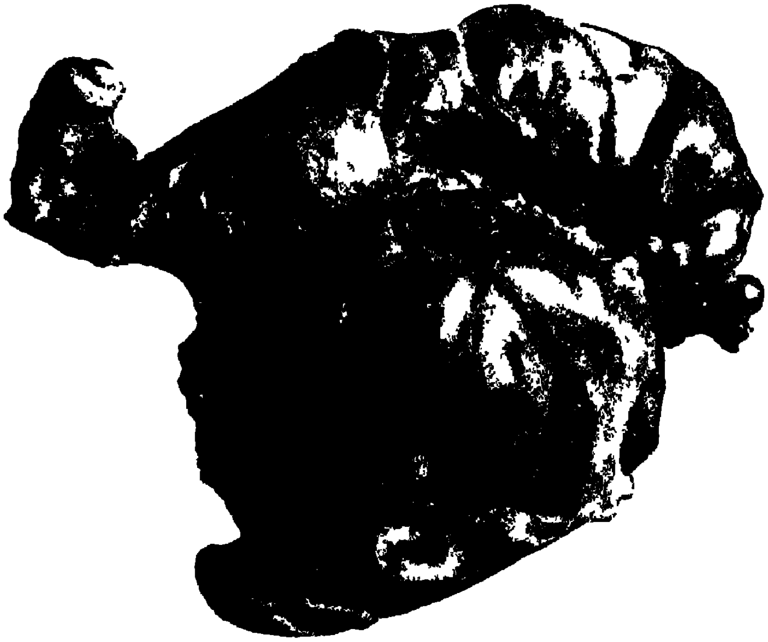

Fig. 375.—Interstitial salpingitis

are in a condition of diminished virulence, produce a tubal catarrh, with a thin mucoserous secretion.

An early result of infectious endosalpingitis is the closure of the abdominal ostium of the tube. The thickened tubal walls, congested or inflamed in sympathy with the inflammation of

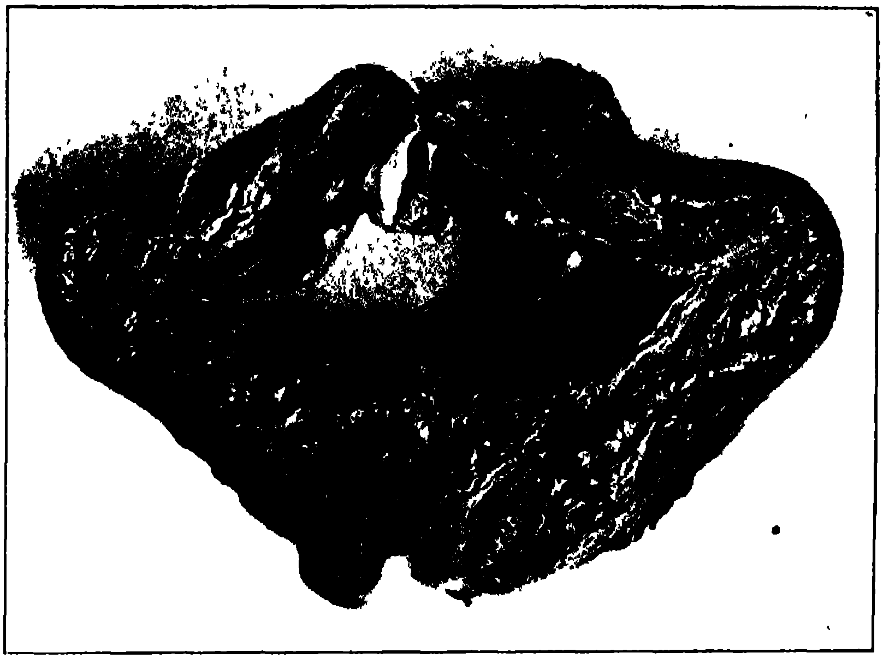

Fig. 376.—Interstitial salpingitis; tube laid open by median longitudinal section.

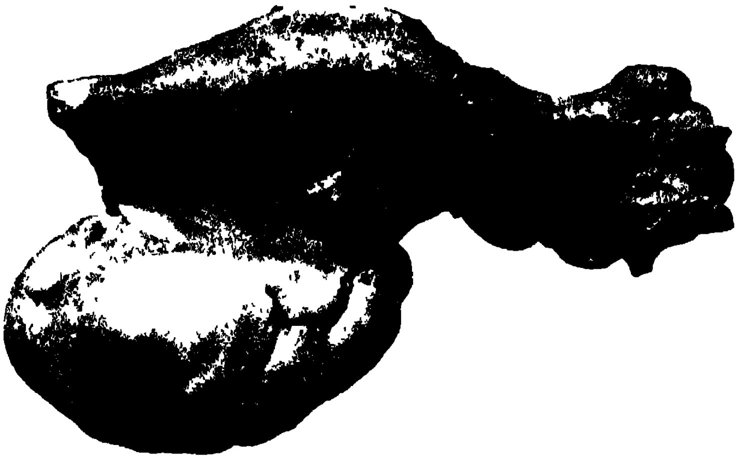

Fig. 377.—Interstitial salpingitis

the interior, grow out beyond the fimbriæ, encircling them, so that they adhere by their external peritoneal surfaces and in time completely disappear. Another method of closure is by an exudate of lymph around and over the fimbriæ, sealing the infundibulum. In this form of peritoneal inflammation around the fimbriated extremity of the tubes the ovary is often involved, so that one or more follicles open when they rupture into an inclosed space containing the tubal fimbriæ. The fluid continuing to accumulate and the follicle to expand, a follicular cyst of the ovary by gradual distention grows around the abdominal end of the tube; hence in a tubo-ovarian cyst, as it is called, the fimbriæ are always found in the interior of the ovarian follicular space, usually adherent to its wall.

As pus accumulates within the tube in a pyosalpinx, the lumen is distended and the mucosa is enormously hypertrophied The degree of distention depends to a great extent upon

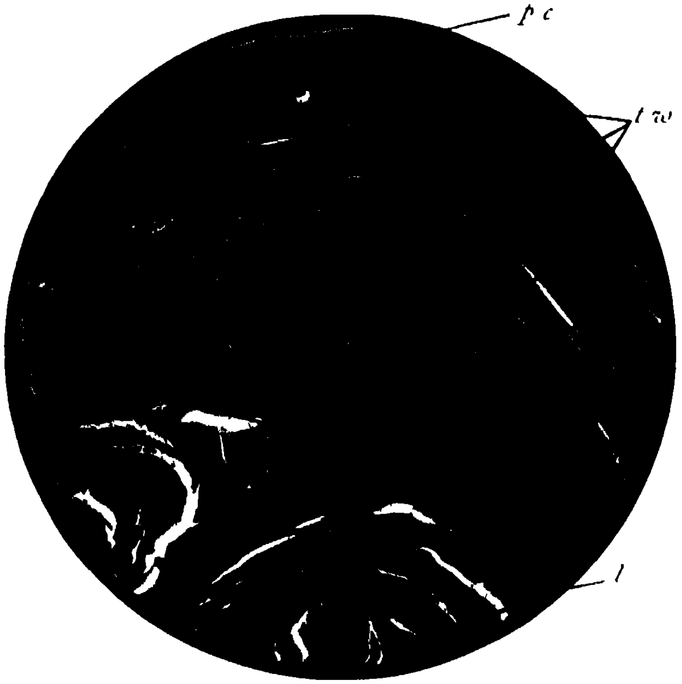

Fig 378.—Showing thickening of tubal wall in chronic interstitial salpingitis: *l*, Lumen of tube; *p.c*, peritoneal coat; *t.w*, tube-wall (McConnell and J C. Hirst).

the implication of the tubal walls in the inflammation; if there is a pronounced interstitial salpingitis with great thickening of the muscularis, the distention of the tubal canal is limited or does not occur at all.

If the tubal walls offer feeble opposition to the distention of the canal, the tubal cyst may reach the size of a fetal head, the walls are very thin and the tubal mucosa, even in a pus-tube, exhibits an atrophy as extreme almost as is seen in hydrosalpinx or hematosalpinx.

The distention of the tubes is confined mainly to the outer two-thirds. The inner third is commonly thickened, but not distended. The canal of the inner third is reduced in caliber by the thickened walls, by the thickened mucosa, and by actual strictures, such as are seen in the male urethra. The canal is further obstructed by the sharp angulation commonly seen at the junction of the distended and non-distended portions Hence the escape of the pus into the uterine cavity or the natural drainage of a pyosalpinx is almost impossible. The mechanical difficulty of a spontaneous discharge of the tubal contents is likewise increased by the displacement of the outer two-thirds of the tube downward and backward. It does, however, sometimes occur and may be favored by appropriate treatment as will be indicated later. The tubal walls may be atrophied by the pressure from within. More commonly they are hypertrophied generally (interstitial salpingitis) or locally (*salpingitis nodosa isthmica*) There may be multiple abscesses in the tubal walls in cases of streptococcic infection (*salpingitis interstitialis disseminata*—Zweifel). The blood-vessel walls in the muscularis are thickened and show hyaline degeneration. The usual serpentine course of the tube is often converted in a pyosalpinx into a corkscrew course. Knob-like projections appear, therefore, upon the surface where the spiral turns of the tube throw it into greatest prominence.

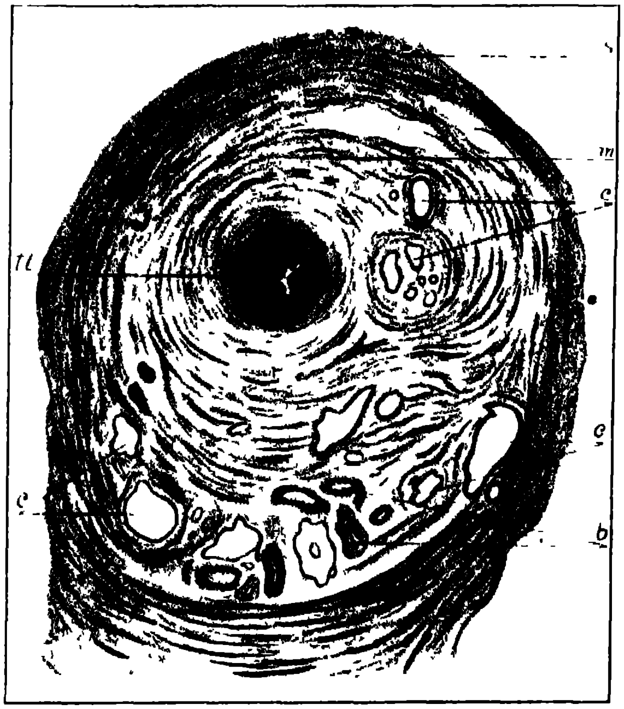

Fig 379.—Salpingitis isthmica nodosa cystica: *tl*, Lumen of tube; *c*, cystic cavities, *b*, blood-vessels; *m*, circular muscle-fibers; *s*, subserous layer There is no communication between the cyst-cavities and the lumen of the tube (Kleinhans)

Gonococci confine themselves, as already stated, mainly to the tubal mucosa, but they may invade the muscularis and even the serosa. Streptococci almost always penetrate the tubal walls, usually arriving in the tubal canal through its walls. The peritoneal surface is therefore commonly affected in streptococcic infection, patches of purulent lymph clinging to the tubal serosa as they do to coils of intestines in general peritonitis. The

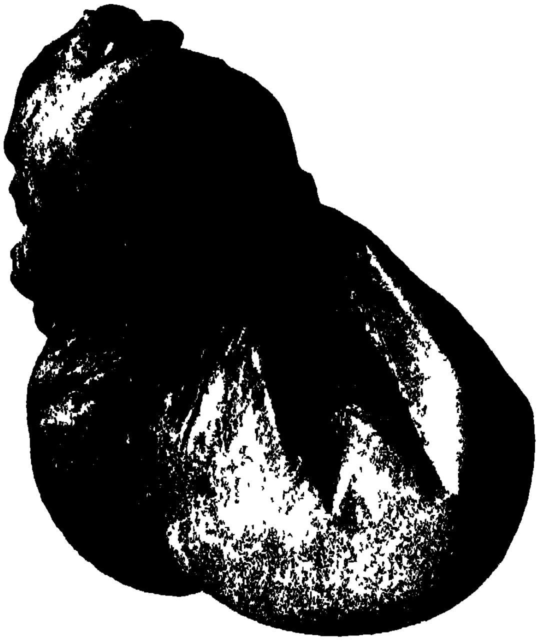

Fig. 380.—Hydrosalpinx

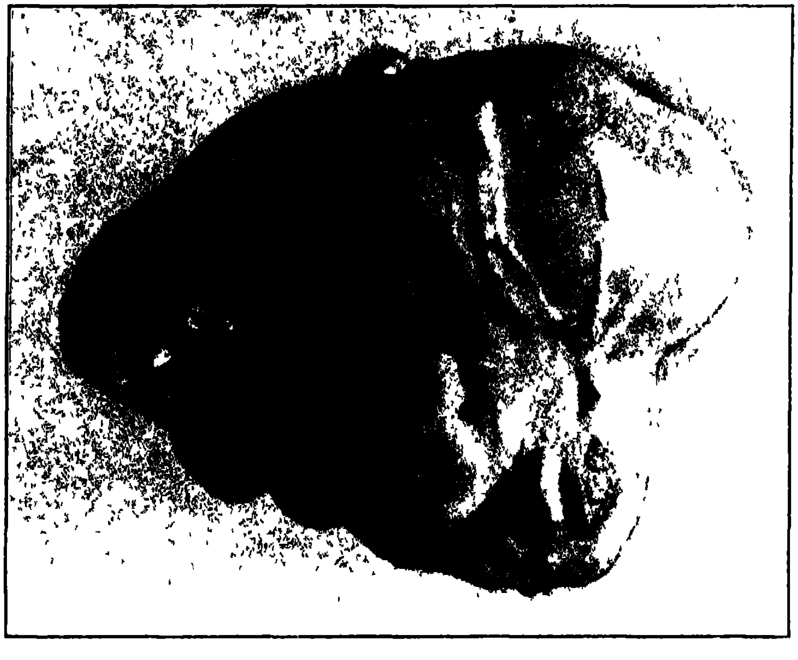

Fig 381.—Hydrosalpinx.

mesosalpinx or the connective tissue between the layers of the broad ligament just beneath the tubes is always much thickened in streptococcic infections, sometimes to a half inch or more, a condition which may embarrass the operator in cases of puerperal infection, necessitating drainage of the infiltrated and infected broad ligament and making hemostasis difficult

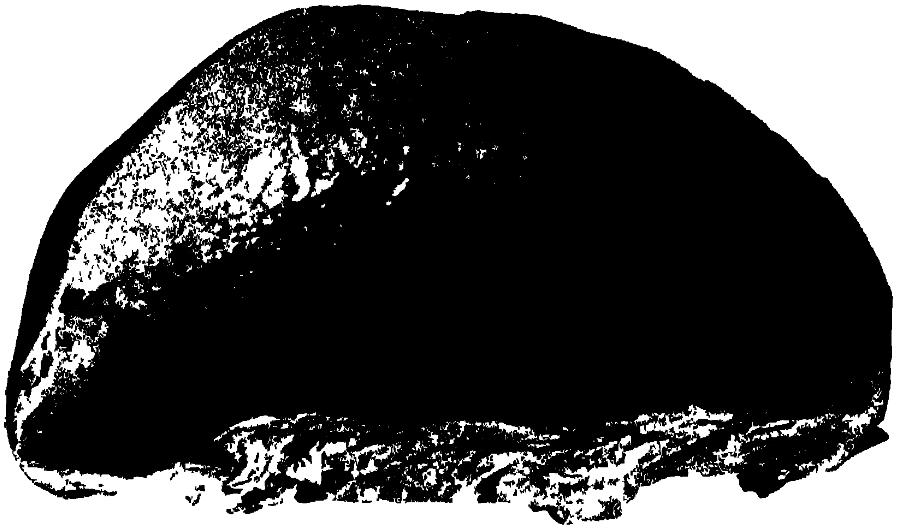

Fig. 382.—Hydrosalpinx, laid open.

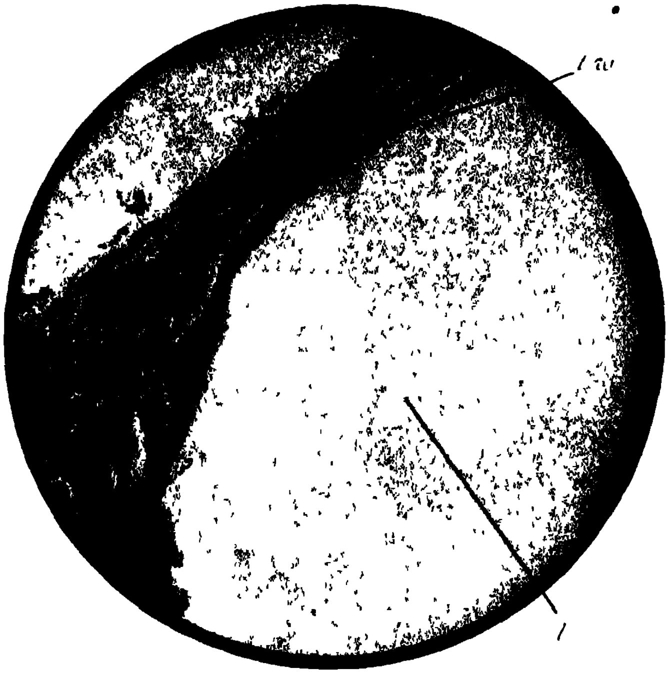

Fig. 383.—Hydrosalpinx, showing thinning of the tube-wall and atrophy of mucous membrane: *l*, Lumen of tube, with mucous membrane gone; *t w*, thinned-out tube-wall (McConnell and J. C. Hirst)

The localized hypertrophies of the tubal wall named by Chiari *salpingitis nodosa isthmica* form sharply circumscribed knobs on the uterine portion of the tube, from the size of a pea to that of a bean. They consist mainly of hypertrophied circular muscle-fibers, inclosing a cystic space lined with epithelium, which is obviously an offshoot from the tubal mucosa. The latter in the tubal canal is converted into a sort of scar tissue; the epithelium has its cilia.

Chiari and Schauta explain these growths by the excursion of a portion of the tubal mucosa into the muscularis, which is excited by the presence of the foreign structure to continual contraction and so experiences a localized hypertrophy. Evidences of chronic tubal inflammation always accompany these growths They were formerly described under the name of tubal myomata or fibroids

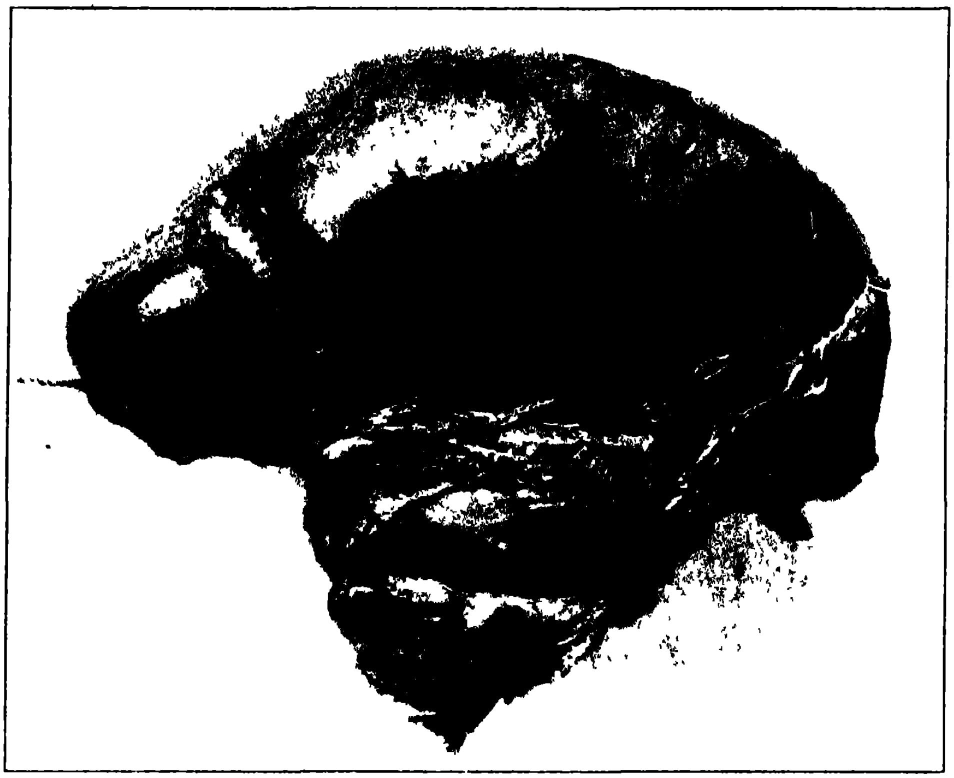

Fig. 384.—Hematosalpinx

Hydrosalpinx[1] is a form of tubal inflammation in which the abdominal ostium, possibly the uterine ostium also, is closed and in which there is an accumulation of serous fluid or thin mucus in the tubal canal, usually in its outer two-thirds Ordinarily the distention of the tubes is considerable, their walls are very thin and atrophic. They present the appearance of a thin-walled cyst with the clear liquid contents showing through the walls.

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[1] Synonyms: hydrops tubæ, sacrosalpinx serosa, dropsy of the tubes

There is always a perisalpingitis in every case of hydrosalpinx which closes the abdominal ostium ; there need not be, and often is not, any other inflammatory action of the tube itself. There must also be a closure or obstruction of the uterine ostium or the isthmus of the tube, otherwise the thin serous contents would drain into the uterus. This sometimes happens (*hydrops*

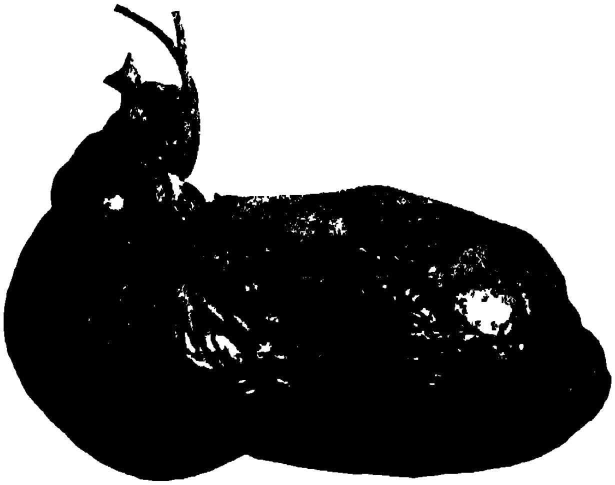

Fig 385 —Hematosalpinx

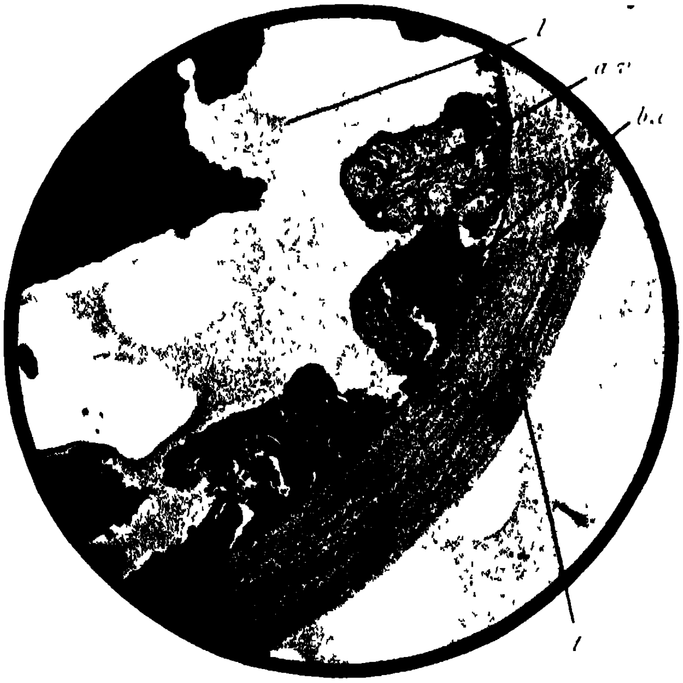

Fig 386.—Hematosalpinx: *a.v*, Atrophied plications of mucous membrane; *b.c*, blood-clot; *l*, lumen of the tube; *t*, tube-wall (McConnell and J. C. Hirst).

tubæ profluens), but the sac usually refills. The muscularis and the mucosa of the tube exhibit an extreme degree of atrophy. The latter is a thin single layer of epithelium flattened by pressure to cuboidal or endothelial-like cells. The plications are

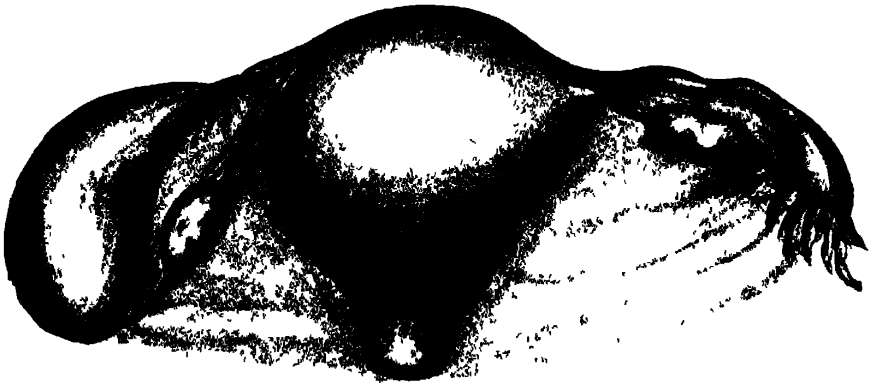

Fig. 387 —Torsion of Fallopian tube. Diagrammatic. The ovarian and broad ligaments are necessarily involved in the torsion. In this case the tube and ovary were lifted out of the abdomen by light traction There was no necessity for a ligature

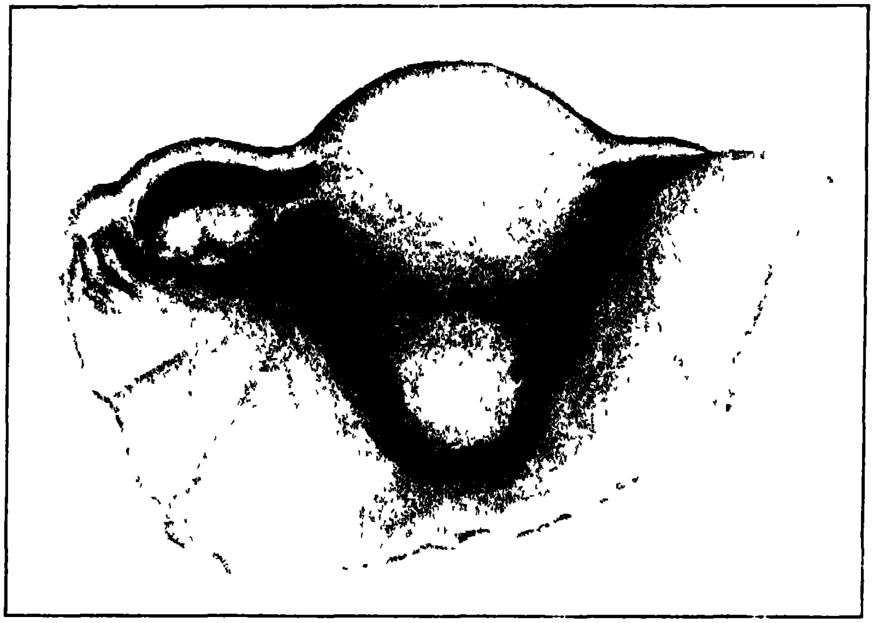

Fig 388.—Destruction and complete absorption of the outer two-thirds of the tube and of the ovary following torsion (University Hospital).

represented by slightly elevated lines joining at the site of the abdominal ostium like the groins of interlacing arches.

In exceptional cases the tubal walls in hydrosalpinx are thickened to a marked degree. The quantity of fluid in such instances is small Hydrosalpinx is usually bilateral. There is a previous history of puerperal infection in the majority of cases.

The size of the tumors is commonly moderate, but the liquid contents have measured a liter or more.

Hematosalpinx is an accumulation of blood in a tube, closed at its abdominal end and obstructed or closed at the uterine ostium or isthmus.[1] The origin of the blood might possibly be a hemorrhage from the ovary or a reflux from the uterine cavity, but it is practically always from the tubal mucosa, the result of tubal menstruation, extreme congestion, or inflammation. The hematosalpinx associated with gynatresia possesses particular interest for the gynecologist on account of its liability to infection and to rupture with infection of the peritoneum, which a simple blood effusion would not do. The explanation of this phenomenon usually offered is that a hematosalpinx is only found in an acquired atresia; that it is the result of infection and inflammation of the tubes, and that it may precede the acquired atresia of the lower genital canal. But the author and others have observed an enormous hematosalpinx in cases of congenital atresia It is likely that every hematosalpinx is the result of an inflammatory process, if not of the tube itself, at least of the structures surrounding the abdominal ostium. The blood may exude from the tubal mucosa as it does from the endometrium, or it may escape from ruptured blood-vessels The cause of the hemorrhage is a tubal menstruation or an acute and extreme congestion of the tubes from torsion or any of the causes already enumerated obstructing the circulation Torsion is most apt to affect a tube already distended ; hence a hydrosalpinx, which with its thin walls is likely to be twisted on itself, may thus be converted into a hematosalpinx. The physical peculiarities of the latter closely resemble the former, there is the same distention of the outer two-thirds of the tube, possibly to the same degree, the same thin atrophic walls and the atrophied mucosa. The color of a hematosalpinx is naturally different, and after the evacuation of the blood the lining of the tubal canal is stained brown by the blood pigment

Tuberculosis of the tubes is commoner than in any other portion of the genital tract [2] In 4470 postmortem examinations tuberculosis of the tubes was found 53 times. V. Rösthorn (103), Martin (620), and Williams (91) in 814 cases of salpingitis found tuberculosis in 29 [3] Menge[4] in 70 cases of pyosalpinx found tuberculosis in 7. In 22 cases of salpingitis in the author's service, examined in the pathological laboratory of the Howard Hospital in the first six months of 1902, 4 were tuberculous. Tuberculosis of the tubes is almost always bilateral. The tuberculous infection is either primary or secondary. The tubercle bacilli in secondary infection, which is much the commoner, are derived from some tubercular focus elsewhere in the body; in primary infection they are introduced from without and first settle in the tubes. There can be an ascending or a descending infection The latter from the peritoneum is always secondary, the former from the uterine cavity can be either primary or secondary. A secondary infection may be metastatic by way of the blood-vessels from some focus situated in a distant part of the body It may be due to contiguity, as from a tuberculous ulcer in the bowel which has become adherent to the tube It is claimed that a primary infection of the tubes may occur from the blood or lymphatic current, the bacilli leaving no trace of infection at the point of their original entrance into the body. A small ulcer or abrasion at the vaginal introitus is supposed to be the most frequent point of entrance in such cases Mixed infections of the tubes have been noted. Whether gonococci, streptococci, and colon bacilli make the tube which they have infected more susceptible to tubercular infection, or *vice versâ*, is not yet determined. The tuberculous tube in an advanced stage of the inflammation is thickened, distended, tortuous, hard and knobby in feel. The peritoneal surface may be thickly peppered with visible tubercles or may be flecked with cheesy deposit. The abdominal ostium may be closed or open; in the latter case pus of a varying consistency from a thin, serous discharge to a thick, cheesy material may ooze out of it. The mucous membrane is thickly studded with tubercles, may be necrotic, even exfoliated The tubal wall is thickened, often markedly so, and in its whole length from its

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[1] Chrysopathes reports a case of bilateral adenomyoma of the tubal isthmus obstructing the tubal canals (" Zeitschr f. Geburtsh u. Gyn.," xliv, 3).

[2] Williams, "Tuberculosis of the Female Generative Organs," "Johns Hopkins Hospital Reports," 1892, iii.

[3] Veit's "Handbuch der Gyn ," vol 3^2, p. 724.

[4] "Ueber tuberculose Pyosalpinx," "Verhandl. d Ges. f. Geb.," "Centralbl. f. Gyn ," 1894, p. 24.

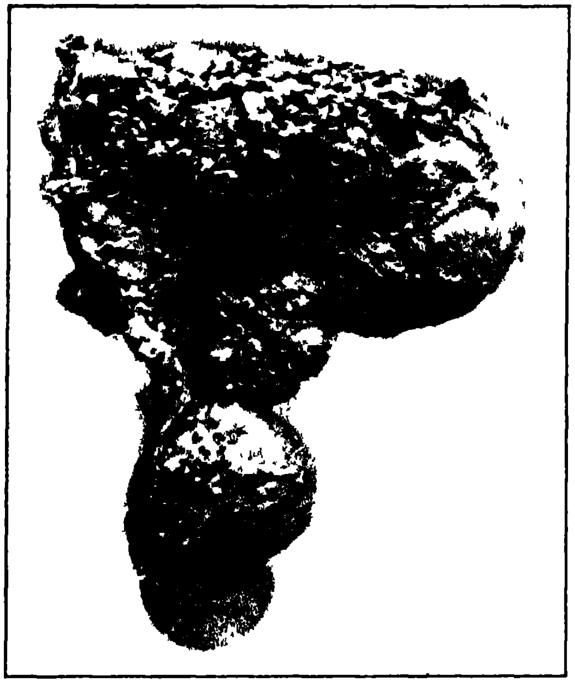

Fig 389.—Tuberculous pyosalpinx.

insertion in the uterus. The tube may have the ordinary shape of a pus-tube with the greatest distention in the outer two-thirds, or, as in one of the author's cases, the distention may affect only the outer third, which suddenly expands in a spherical shape, in sharp contrast with the inner, unaffected two-thirds of the tube. In tuberculous tubes more than in any other form of salpingitis the tube-wall is knobby or lumpy in feel from localized hypertrophy or infection of the muscularis.

Williams divides tubal tuberculosis into miliary, chronic diffuse, and chronic fibroid forms. Another division is made into an acute form, in which there is a rapid destruction of both the mucosa and muscularis, and a chronic form, in which there is the gradual development of a tubercular pus-tube. In the acute form there is round-cell infiltration of the mucosa, numerous tubercles with comparatively few giant-cells, but many tubercle bacilli In the chronic form the tubercles contain many giant-cells, but fewer bacilli. The mucosa may show a vegetating growth so luxuriant as to simulate malignancy As in all forms of chronic inflammation of the tubal mucosa, there are adhesions of the plications and the formation of cyst spaces underneath.

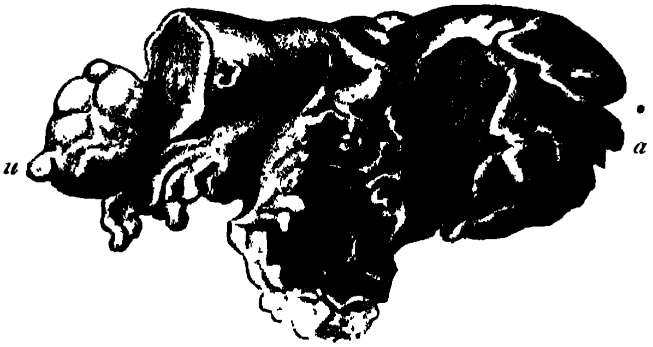

Fig. 390 —Primary carcinoma of the tube. *u*, Uterine end; *a*, abdominal end (Kleinhans)

Tubercles, giant-cells, and bacilli may be found in the muscular tubal walls as well as in the mucosa.

The termination of a tubercular salpingitis may be spontaneous cure by calcification of the tubal contents, or encapsulation either by dense adhesions or by enormously thickened tubal walls. There may be fatal infection of the whole organism or of a distant organ by metastasis. There may be infection of neighboring structures by contiguity, as the uterus, the peritoneum, or the intestines

In *syphilis* the tubes may be thickened, tortuous, infiltrated with round cells, and the seat of gumma. The tube has been found inflamed in two cases in consequence of *actinomycosis*. Eighty cases of *echinococcus* infection of the tubes have been collected.[1]

Neoplasms of the Tubes.—Polyps, papillomata, sarcomata, fibromyomata, dermoids, lipomata, fibromyomata cystosa, carcinomata, lymphangioma, deciduoma, enchondroma, and cysts have been observed.[2] Carcinoma of the tube is not infrequently secondary to malignant disease of the uterus or ovary. It may be primary. It is derived from the tubal mucous membrane and takes a papillary form. Inflammatory disease seems to have a causative relation with it. The situation is usually in the middle or outer third of the tube. In consistence the tumor is always medullary.

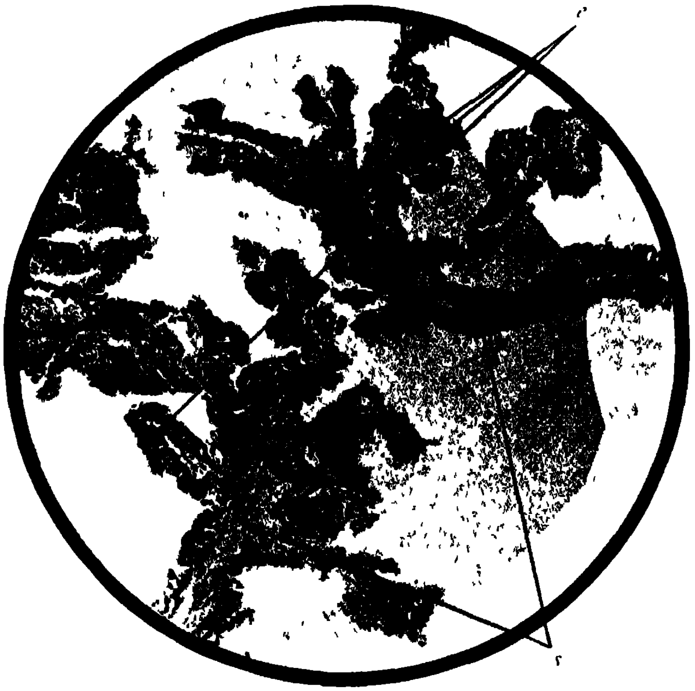

Fig 391.—Papillary carcinoma of the Fallopian tube: *e*, Hyperplasia of columnar epithelium; *s*, fibrous stroma of villi (McConnell and J. C. Hirst).

Bilateral carcinoma of the tubes has been noted as a rare occurrence. According to Kleinhans, 5 cases of tubal sarcomata have been reported. Sänger[3] collected 6 cases of benign papillomata of the tubal mucous membrane. Gonorrhea seems to be a predisposing cause.

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[1] Veit's "Handbuch," p. 739, vol. 3^2.

[2] Quénu et Longuet, "Des Tumeurs des Trompes," "Rev. de Chir.," Oct 10, 1901.

[3] "Verhandl. d. Ges. f Geb. zu Leipzig," 1890-91, p. 30.

Symptoms of Tubal Disease.—The most prominent subjective symptom is pain, usually localized in the groin above the middle of Poupart's ligament. If both tubes are alike diseased the pain is more acutely felt on the left side. If the disease is unilateral the suffering is confined to the side diseased. The pain is variously described as shooting, stabbing, boring, burning, or an intense ache. In acute salpingitis the pain is usually lancinating. The patient walks with a cautious tread, the body is bent forward, and the hands are often held outspread over the lower abdomen as if to protect it. The statement is made that a sudden turn in bed, a cough or sneeze, coitus, or a sudden jolt or jar from any cause occasions a sharp stab of pain. There is almost invariably an exacerbation of pain in the period of premenstrual congestion, relieved when the flow appears, returning in aggravated form when it ceases. The pain, therefore, is greatest before and after menstruation. There is usually backache, which may be the predominant symptom. The pain, instead of being localized, may be manifested in distant regions as headache, pain in the nape of the neck, the top of the head, the breast, the axilla, or the epigastrium. The rectum is frequently the seat of pain.

There is often a history of leukorrhea on account of the infection of the cervical and corporeal endometrium which precedes, accompanies, or follows the infection of the tubal mucosa. Occasionally the discharge emanates from the tubes themselves, in intermittent gushes of pus or serum (*hydrops tubæ profluens*). Menorrhagia is a common, almost a constant accompaniment of tubal inflammatory disease. The period is lengthened, the interval is shortened, and the quantity of blood lost is abnormally great. In rare instances the menorrhagia becomes a metrorrhagia so profuse and long continued as to cause a profound anemia, and actually to threaten the woman's life. In exceptional cases the menstruation may be scanty or there may be amenorrhea on account of uterine anemia, because the inflamed tubes attract blood from the uterus to themselves or by reason of atrophic changes in the appendages or uterus.

There may be and usually is a history of neurasthenia, digestive disturbances, loss of weight, and failing strength. The patient with diseased tubes rarely presents an appearance of good health. She is thin, has a bad color, an anxious expression, and looks prematurely aged. She may present the waxy pallor of extreme anemia or a cachectic appearance from toxemia, suggesting malignancy or tuberculosis.

In exceptional instances inflamed, distended, and adherent tubes have no apparent effect upon the woman's general health and may cause wonderfully little local disturbances

On abdominal palpation the patient winces under deep pressure over Poupart's ligaments and may be unable to endure the slightest pressure in that region.

On a bimanual vaginal and abdominal examination it is usual to find the diseased tube, or tubes, distended, thickened, prolapsed into Douglas's pouch, and adherent. In acute cases the lightest touch of the internal finger in the posterior vaginal vault elicits a shriek of pain. There is nothing so sensitive in the lower abdomen as an acute pyosalpinx with involvement of the ovary, except a tubal gestation sac. In chronic cases there is almost always exaggerated tenderness, but rarely agonizing pain on palpation. From the prolapse of the fimbriated extremity of the tube and of the ovary with the consequent drag upon the cornua of the uterus by means of the tubes and the ovarian ligaments there is almost always some backward displacement of the uterus, which is usually fixed about midway between ante- and retroflexion, being prevented from turning completely over backward by the combined bulk of the distended tubes, the ovaries, and the inflammatory exudate in Douglas's pouch. If the bulk of the inflammatory mass is not great, there may be and usually is complete retroflexion with the accompanying physical signs of a chronic metritis, a congested, soft, and enlarged uterus The position of the uterus, however, is not necessarily faulty. It may be in a position of normal anteflexion, may be unaltered in size, or may be markedly atrophic. The tubes themselves may occupy a normal position, may lie in front of the uterus, between it and the bladder, or may run a course obliquely upward and forward to the iliac fossæ

If, as is usually the case, they are prolapsed into Douglas's pouch and are distended, they may be so intimately adherent to the sides and back of the uterus as to be distinguished with difficulty from the uterine corpus; but a careful bimanual examination almost always enables the experienced specialist to outline the uterus and to differentiate the more globular, softer, and more sensitive structures adherent to it. The adhesions may be so intimate, however, and the tubal wall may be so dense and hard that an old pus-tube is regarded as a subperitoneal fibroid. There is no gynecologist of large experience who has not made this mistake. If the tube lies approximately in its normal position, it is easy, as a rule, to roll it between the examining fingers and so to determine the amount of distention, the infiltration of its wall, the density and extent of the inflammatory exudate or adhesions around it. Even if it is prolapsed into Douglas's pouch and constitutes there a conglomerate inflammatory mass with the ovary and plastic exudate, it is not ordinarily difficult to trace its course from the uterine cornu to its abdominal extremity and to determine with approximate accuracy its shape, size, and the thickness of its walls. In the course of an examination which often immediately detects the presence of tubal inflammatory disease, certain facts of importance in a differential diagnosis should be carefully noted. If the tube is distended its abdominal orifice is almost certainly closed and its uterine extremity is probably occluded or obstructed. It must be distended by pus, blood, or serum. If by the first the tubal walls are usually much thickened and the sensitiveness is great, the greater the more acute the process. There is not so much tenderness in hydro- and hematosalpinx; in these conditions the tube-walls are commonly very thin and a distinct fluctuation may be appreciated. If the tube is very much thickened as it leaves the uterine cornu, if it is strikingly knobby in feel, the suspicion of tuberculosis must be entertained. The history of the patient and signs of tuberculosis elsewhere, especially in the visible genitalia or in the peritoneum (encysted ascites), strengthen the suspicion. On the contrary, a history of gonorrhea or signs of such infection in the genital tract point to a gonorrheal pus-tube.

A rounded node or nodes on the isthmus indicate the possibility of *salpingitis isthmica nodosa*, but the folds of a tortuous tube may simulate this condition exactly to the sense of touch. A tube thickened, hard in feel, rolling stiffly under the fingers, but not distended, indicates chronic interstitial salpingitis without closure of the abdominal ostium. The rarer tumors of the tube which have been mentioned are only diagnosticated by abdominal section, the removal of the tube and its careful pathological examination. A solid tumor, however, excessively painful, associated with cachexia and ascites, indicates malignancy.

The treatment of tubal inflammation is preventive, palliative, or curative.

The preventive treatment is a serious problem confronting the physician in his daily work, but often beyond his control. If the social evil and its attendant risk of venereal infection could be eliminated, the large majority of tubal inflammations in women would disappear. It has been estimated that there are at the present time a million men with gonorrhea in the United States. From his experience in dispensary, hospital, and private practice the author is convinced that a prostitute is certain to be infected with gonorrhea within a few weeks of the time she begins her career. The number of innocent women that one such creature can indirectly infect is incalculable, but it must be very large. The physician can accomplish some good perhaps by warning young men of the practical certainty of venereal infection from women of loose character, and by combating the prevalent idea that gonorrhea is a small matter, easily cured, and with no permanent results. The man who is known to have gonorrhea should be warned against matrimony until repeated bacteriological examinations of the urethral discharge show that it is sterile. The man already married who contracts gonorrhea must be clearly informed of the danger of infecting his wife, and urgently warned against subjecting her to the possibility of it until ample time has elapsed after apparently successful treatment and until repeated bacteriological examinations have shown that his urethral discharge is no longer infectious. The physician is not infrequently in the painful position of knowing that a husband is gonorrheic, of recognizing the disease in the wife, possibly in a mild form, and of realizing the necessity of avoiding a fresh or more virulent infection. Great as his indignation must be at the criminal indifference or ignorance of a man who will subject his wife to the risk of venereal infection, strongly as his sense of duty to his patient must impel him to warn her of the danger she incurs, the physician's lips must often be sealed. He can only endeavor to obtain protection for his patient by a private appeal perhaps to the husband, by forbidding coitus as injurious to the woman's general health or local condition, or by instituting such local treatment—for example the continuous use of tampons for months at a time—as will effectually prevent it. An injudicious word, a betrayal of information obtained by a medical examination, may disrupt a family, separate husband and wife and a father from his children. However richly the man may deserve such punishment, it is not the physician's function to inflict it

The other most frequent cause of tubal inflammation, puerperal infection, is more directly under medical control. The proper treatment of abortion, by an aseptic curettage, an adequate aseptic technic in the management of labor, including the invariable use of rubber gloves for internal examinations and manipulations, should almost banish puerperal infection and its consequences from medical practice. Criminal abortion still remains, however, as a prolific source of tubal disease beyond the reputable physician's control.

The palliative treatment of tubal inflammations is indicated in the acute stage, in the chronic stage if the uterus is retroverted and the inflamed tubes and ovaries are prolapsed into and adherent in Douglas's pouch, both to the uterus and the rectum, and in exacerbations of an old tubal inflammation. If there is a very large accumulation of pus, blood, or serum in the tubes, or if the latter are so situated laterally that they are inaccessible to manipulation or pressure through the vaginal vaults, local palliative treatment is usually waste of time.

The objects of palliative treatment are to allay acute inflammation, to lessen the pain, to correct the malposition of the tubes and the retroversion of the uterus that usually accompanies it, to secure an evacuation of the tubal contents, to stretch or cause the absorption of the adhesions around the tubes and to neighboring organs, especially the rectum ; to promote the absorption of the infiltration of the tubal walls ; to control the metrorrhagia that is often associated with salpingitis, and as a secondary object to make conception possible in a woman who is sterile as long as the malposition of the tubes, the closure of the abdominal ostia, and their envelopment in exudate continue.

All of these objects may occasionally be attained in cases that at first sight appear most discouraging.

The means by which they may be accomplished are the use of tampons, hot-water douches, abdominal massage, hot or cold applications to the lower abdomen, and curettage.

In acute salpingitis with fever and intense pain, rest in bed is required. Hot douches of a gallon of water at a temperature of 115°–120° F. should be administered night and morning. After the douche a lamb's-wool tampon saturated with boroglycerid or with ichthyol 4 parts, glycerin 6 parts, should be inserted in the vagina and pushed well up into the vault Another tampon dusted with dry boracic acid powder should be next inserted to keep the first in place The ice-water coil on the lower abdomen usually gives the greatest comfort and is most efficacious as an external application

If cold is uncomfortable to the patient or fails to relieve the pain, moist heat in the shape of a large flaxseed-meal poultice covered on its inner side with a single layer of gauze and protected externally by waxed paper or oiled silk should be substituted. A free evacuation of the bowels must be secured by the milder salines, Rochelle salts, Carlsbad water and Sprudel's salts, Hunyadi water, Kutnow's salts, and the like A few days of this treatment usually results in a disappearance of fever, a relief of pain, and a wonderful improvement in the patient's general condition It is then possible to decide whether an operation is indicated or whether all traces of the inflammation have disappeared. In the former case the outlook is much more favorable for the patient than if the operation were undertaken in the midst of an acute infectious process. In the latter case no further treatment is required.

In acute exacerbations of an old salpingitis the same treatment is indicated, but complete subsidence of the inflammation and disappearance of the tubal inflammation are not to be expected. The palliative treatment in such a case should usually be preparatory to an operation. In a chronic case perhaps of long continuance, possibly in a more recent case after the acute symptoms have subsided, leaving displaced, adherent, distended tubes, palliative treatment may be indicated for several reasons. The patient may demand the exhaustion of every other means of treatment before resort to an operation, there may be special reasons why an operation is undesirable in a given instance, as the existence of kidney disease or a profound reduction of the general health and strength; or the physician may desire to convince himself and his patient that nothing but an operation will give satisfactory results.

The kind of chronic case promising the most from palliative treatment is one in which the tubes and ovaries are displaced into and adherent in Douglas's pouch both to the uterus and the rectum and in which there is a retroflexion of the uterus. Before undertaking the treatment of such a case the patient should be clearly informed of the following facts The treatment is tedious, it is often trying to the nervous system, its results are uncertain; it is possible that the local disturbance involved in the treatment may aggravate rather than improve the inflammatory condition; it may be necessary to give it up and to make a choice between enduring the symptoms of the pelvic inflammation or of submitting to an operation; and finally, after weeks of patient effort on the part of physician and patient, the result may be disappointing and an operation, after all, be required to relieve the symptoms. On the contrary, in exceptional cases there is a complete symptomatic cure and such an improvement in the physical conditions locally that it is difficult to find evidences of the grave pelvic inflammation which existed when the treatment was begun. Pregnancy may occur after improvement in the position and condition of the tubes and may complete the cure by the stretching or absorption of the remaining adhesions.[1] The local palliative treatment to secure such results is simply the use of long-continued pressure by elastic lamb's-wool tampons packed tightly into the vaginal vaults and canal. The patient is put in the knee-chest posture. A Sims' speculum is inserted and held by a nurse. A lamb's-wool tampon is dipped into a clean glass dish filled with boracic acid and is packed somewhat forcibly into the posterior vaginal vault by means of an Emmet's curetment forceps which is held with its convexity upward—that is, upside down. Tampons are packed in one after the other until the posterior vaginal vault and the rest of the vaginal canal to within an inch of its orifice are filled as tightly as possible. The woman rests for half an hour afterward. She removes the tampons forty-eight hours later by the strings attached to them and takes a douche of boracic acid (ʒij to Oij) just before her return to the physician's office. On the odd days when the treatment is not being carried out, deep abdominal massage is an advantage This treatment is kept up continuously for six to twelve weeks except during menstruation. The general health, the blood, the diet, and the bowels must naturally receive attention. Systematic exercise in the open air with regular periods of rest in the recumbent posture twice a day should be ordered. The steady pressure on the uterus and tubes, the improvement in the lymphatic and blood circulation due to the massage, may elevate the tubes and uterus to a normal position, may evacuate the former of their contents, may stretch or cause the absorption of the adhesions to the bowel which are often the source of the greatest discomfort, and may restore patency to the tubes, as is evidenced by subsequent impregnation.

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[1] Every year the author secures such results in his office practice, though it must be admitted that they are exceptional.

The internal massage proposed by Thure Brandt has not proved satisfactory[1] and there are obvious objections to its employment

Electricity in pelvic inflammation is illogical and proved inefficacious in a two years' trial some time ago in the author's hands.

If a persistent trial of the local treatment described above is not successful, the patient must choose between the endurance of her symptoms or relief by an operation. Curettage is rarely indicated in salpingitis, but it has its uses. There are cases—exceptional, it is true—in which metrorrhagia is the predominant symptom, reducing the patient to an extreme degree. Even if an abdominal operation is determined upon, in such a case it is safer if the patient's anemia is first improved. Moreover, the removal of the endometrium, especially about the uterine ostia of the tubes, followed by a firm tamponade of the vagina, has resulted in a discharge of the tubal contents into the uterus and the disappearance of the symptoms of salpingitis. There is unquestionably some danger of relighting a fresh inflammation of the tubes and pelvic peritoneum by the use of a curet in the uterus with inflamed tubes alongside of it. The operation, therefore, should only be undertaken in a well-appointed clinic, with the understanding that it might be necessary to follow it by a vaginal or abdominal section if symptoms of fresh inflammation appear. The danger, however, is not great in a carefully conducted curettage. The author has not yet experienced it in the few cases under his care demanding this treatment.

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[1] I have given this method a thorough trial by referring patients to graduates of the Copenhagen Institute, but the results were disappointing and not a few patients found the treatment unendurable

The curative treatment of salpingitis is usually operative. It is indicated in very large pus-tubes such as are illustrated in figures 369 to 372; in cases with so much suffering that the patient urgently demands relief; after the failure of palliative treatment; in women who can not afford invalidism, which in the poorer classes may mean pauperism; in patients who are not willing to lead a life of comparative uselessness; in those who deliberately select the radical treatment to be relieved of their symptoms; and in cases of serious nervous and physical deterioration, the consequence of the pelvic disease. It is also justifiable for the relief of sterility without other serious symptoms. It may be demanded in cases of acute infection with persistent fever, coincident pelvic abscesses, and other symptoms of sepsis; to anticipate a rupture of the tube into the bowel; by fistulæ into the bowel or elsewhere after the tube has been perforated, by evidences of tuberculous infection of the tube or by symptoms justifying the suspicion of malignancy Acute peritonitis in the course of a salpingitis may be an urgent indication for immediate operation. It is plain, therefore, that the large majority of the cases of salpingitis are only amenable to or actually demand operative treatment.

The operations available for the cure of salpingitis are severance of adhesions and reposition of the tubes; salpingostomy; salpingectomy, partial or complete; salpingo-oophorectomy; and hysterectomy with removal of the tubes and ovaries. The tubes may be approached for any of the operations required by the vaginal or by the abdominal route.

It is always impossible to determine beforehand which one of the operations just detailed is necessary for the patient's symptomatic cure The surgeon should only undertake such an operation with full permission, before witnesses or in writing, to do whatever in his judgment might be necessary, but with the understanding that all structures and organs should be spared that might be left behind without compromising the woman's health in the future or jeopardizing her immediate recovery.

The choice of the vaginal or abdominal route should be governed by the following considerations: If the inflammation is in an acute infectious stage with fever, the vaginal route is the safer. If the woman is profoundly reduced by cachexia or septic intoxication and the loss of nervous strength seen occasionally in chronic cases, especially with large accumulations of pus in the tubes, the vaginal operation shocks her less and has a lower mortality. If the abdomen is very fat, if the vagina is very capacious and plastic operations are to be performed coincidentally on its walls, if the woman is advanced in years, the vaginal route may be preferable. But the operative treatment of salpingitis by colpotomy has grave disadvantages. The operation must often be more radical than it need be; it is safer and easier, as a rule, to remove the uterus and its appendages by the vagina for salpingitis than to do a more conservative operation. During the furor for this operation, originating in France with Doyen, in Germany with Landau, and spreading over the civilized world, thousands of uteri, tubes, and ovaries have been needlessly sacrificed. It is impossible to examine the abdominal contents satisfactorily in a vaginal section, especially the appendix; hence the operation, while often too radical in one sense, is insufficient in another. There is much greater danger of injury to the intestines in a vaginal than in an abdominal section In 290 radical vaginal operations for salpingitis by Landau, Terrier, and Hartmann, the bowel was injured 27 times, or in almost 10 per cent. of the operations.[1] There is a greater danger of primary and secondary hemorrhage than in abdominal section. The latter is more likely to occur from injury to the uterine artery in an attempted conservative operation by the vagina. The former may necessitate the relinquishment of the vaginal operation and a hurried abdominal section. There is a greater danger of obstruction of the bowels after a vaginal section, especially if clamps are used to close the vessels in the broad ligaments; there is likewise greater danger of injury to the ureters. For these reasons the abdominal is to be preferred to the vaginal section except in the limited number of cases already enumerated in which for special reasons the vaginal operation is the safer of the two.

Severance of Adhesions from Perisalpingitis and Reposition of Displaced Tubes by the Abdominal Route.—The tubes themselves may not be structurally diseased nor occluded, but are displaced downward and backward and are adherent to the bowel or to the posterior surface of the broad ligaments, dragging the uterus backward and preventing a reposition of the retroverted uterus. A vaginal section and the separation of the adhesions around the tubes through the anterior or posterior vaginal vault is easily accomplished and sounds plausible, but it is difficult to prevent the tubes from returning to their original position and becoming adherent again. The adhesions can be more safely, thoroughly, and satisfactorily freed by the finger-tip or by a blunt dissection through the abdominal incision, and it is always possible to restore and to retain them in a normal position removed from the raw surfaces from which they have been freed, either by suspending the uterus to the abdominal wall or by suspending the infundibulo-pelvic ligaments (the suspensory ligaments of the ovaries) to the iliac fascia as is done in the operation for prolapsus ovarii (page 451)

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[1] Mainzer, "Arch f. Gyn," Bd xliv, p 421.

Salpingostomy after Abdominal Section.—An incision may be made in the tube to restore its patency if the abdominal ostium is closed, if there are but moderate distention of the ampulla, a fairly healthy condition of the tubal mucosa, and no serious infiltrations of its walls. A linear incision may be made over the top of the tube as near as possible to the abdominal extremity, trusting to the circular fibers on the tubal wall to keep the wound gaping There is greater certainty of success, however, in excising a "window" in the tube-wall, uniting the mucous membrane to the peritoneum by interrupted sutures of fine catgut It has been proposed to sew the ovary into the opening thus made (Gersuny). The object of this operation is to cure sterility. The prospect of success is not brilliant In 77 operations by Gersuny, Martin, and Mackenrodt, conception followed in 5 instances[1] (6.5 per cent).

Salpingectomy by the Abdominal Route—The removal of the tube is indicated if its walls or interior are so badly diseased that there is no hope of a restitution to the normal; if there is no likelihood of symptomatic cure with the tube remaining; if it is the site of an acute infectious process that is likely to spread or develop into a pyosalpinx, as in acute gonorrhea or streptococcic infection; if there is reason to suspect tuberculosis or malignancy. There are several different forms of salpingectomy. The excision of the tube may be only partial; the inner third may be comparatively healthy even with extensive and long-continued disease of the ampulla, and may be left behind—partial salpingectomy. It is often necessary to remove the ovary with the tube—salpingo-oophorectomy The tube may be completely removed by excising a wedge-shaped piece from the uterine cornu whence it emerges—complete salpingectomy. A stump of the tube may be left on the uterine cornu—salpingectomy

The nature of the operation required can only be determined after the abdomen is opened. In addition to the physical conditions exposed to sight and touch, the patient's age, social condition, and circumstances must be taken into account. In a woman approaching the menopause the cessation of menstruation and an enforced sterility are matters of no moment. No risks should be taken of continued or recurrent disease in structures left behind. Even in women of child-bearing age special conditions may make a premature menopause and sterility rather desirable than otherwise. The nature of the disease, as for example tuberculosis, may demand the complete removal of the tubes. The participation of the whole length of the tube in a diseased process may preclude the possibility of leaving any portion of it An associated disease of the uterus or of the parametrium may indicate not only salpingectomy, but hysterectomy as well.

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[1] Veit, "Handbuch der Gyn," vol 3^2, p. 803

But, in general, an effort should be made to preserve all the structures that may be left without danger to the patient's life and health, to make conception possible in the future, and to insure the continuance of menstruation.

In acute salpingitis, gonorrheal or streptococcic, without involvement of the ovaries, with dark red, soft, swollen tubes, the serosa flaked with lymph, perhaps, and drops of pus oozing from the abdominal ostia, the best immediate and future results are secured by complete salpingectomy without removal of the ovaries. The patient's acute symptoms of violent pain and fever disappear; she is saved from the risk of pelvic or general peritonitis, there is no danger of the development of pus-tubes in the future, or of recurrent infections of the tubes, and she menstruates normally In streptococcic infection the tubal disease may be unilateral, in gonorrhea it is likely to be bilateral. In the latter case the woman is rendered sterile by the complete bilateral salpingectomy, but no more so than she would be by double pus-tubes

It is often possible to leave the inner third of one or both tubes and one or both ovaries. Even if only the inner third of one tube and the ovary on the other side remain, the woman is in better condition than if she were rendered necessarily sterile by double salpingo-oophorectomy She is at least sustained by the hope of maternity, and is saved from the pitiable melancholia often seen in the woman intensely desirous of offspring, but conscious that she is doomed to a childless existence Some risk is run by this course of a persistence of symptoms or of an inflammation subsequently developed in the structures remaining, but the author is convinced by a long experience covering the period when no attempt was made to conserve any of the pelvic organs and the later time when the advantages of conservative surgery have been recognized that the latter course is the only one justifiable.

A consideration governing the choice of the way in which a tube shall be removed is the comparative ease and rapidity of the different methods. The quickest, and easiest, and most certain operation for the control of the blood-vessels and the amputation of a tube is to ligate the broad ligament *en masse* with a double ligature[1] and to cut off the tube, ovary, and mesosalpinx above the ligature. In a case necessitating a rapid operation, or if there are technical difficulties making the other procedures embarrassing to the operator, a salpingo-oöphorectomy may be performed which could otherwise be avoided. On the contrary, one of the other methods of salpingectomy may be forced upon the operator by the physical conditions in the tube or broad ligament. In streptococcic infection there is often an extraordinary thickening of the mesosalpinx so that a mass ligature anywhere is out of the question; the blood-vessels must be tied separately and the tube excised entire by cutting it loose from the broad ligament and by a wedge-shaped excision of the uterine cornu. As the blood-vessels are cut they are clamped with hemostats and afterward ligated. Again the tube may be diseased in its whole length; its walls as they leave the uterus may be infiltrated or so necrotic that a ligature cuts through them. In such a case a complete salpingectomy is indicated. In case it is equally easy to resort to any method, and if the whole tube should be removed, the mass ligature of the broad ligament had better be avoided, though it is not such a disadvantageous method as a younger generation which lacks experience with it would have us believe. (See page 618.)

In any case in which the removal of the tubes is indicated the ovaries should not be removed simply because the tubes are. They should be treated on their own merits. If they are comparatively healthy and do not promise to be a source of pain and discomfort in the future, they should not be disturbed. It is quite as easy, if not easier, to remove the tubes without as with the ovaries. In the former case the ligature on the outer edge of the broad ligament is placed between the tube and the ovary, taking in about a third of the broad ligament and including the ovarian fimbria. The incision which frees the tube is made in the mesosalpinx above the ovary.

Hysterectomy coincident with the removal of diseased tubes should also be performed only for distinct disease or abnormality of the uterus. The argument that a uterus without tubes or ovaries is a superfluous organ is fallacious. The uterus contributes to the strength of the vaginal vault. Its removal leads to shortening and contraction of the vagina. Even if the cervix alone is left, the vagina and its vault are more normal than if the vaginal vault ended in a blind pouch closed by cicatricial tissue. Hysterectomy should only be performed coincidently with the removal of diseased tubes if the myometrium is the seat of infection or chronic disease threatening the individual's future health, or if the endometrium is tuberculous or the site of a malignant growth. Hyperplastic interstitial endometritis is not a sufficient indication, nor is chronic gonorrheal endometritis. The former may be cured by a curettage, which should precede almost every operation for salpingitis; the latter may be cured by a curettage and, if necessary, a high amputation of the cervix, for the cervical glands are the source of the intractable uterine leukorrhea resulting from gonococcic infection. Vaginal section, as already stated, has a distinct field of usefulness in salpingitis. It is most valuable in acute infectious inflammation with a large accumulation of pus in the tubes or in the profound cachexia occasionally seen with large pus-tubes. An incision through the posterior vaginal vault around the cervix into Douglas's pouch, enlarged by a linear incision of the vaginal vault in the median line, enables one to pull the distended tubes one after the other into the vagina, incise them, wash out the pus through a two-way catheter, and to pack each tubal canal with a strip of gauze. Douglas's pouch is also packed with gauze. At the end of forty-eight hours the gauze may be removed; if necessary, under temporary anesthesia, the tubes are again irrigated and Douglas's pouch is again packed. The dressing is renewed every second day until all discharge ceases. A complete symptomatic cure may be obtained in this way and nothing more is required. The tubes are closed permanently by granulation tissue in their interior Otherwise the woman is normal and a careful pelvic examination reveals little trace of her former serious disease.[1] At the worst, the infectious stage of the inflammation has subsided and a subsequent abdominal section for the removal or other treatment of the adherent chronically inflamed tubes is comparatively safe.

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[1] For the detailed technic of salpingectomy see page 618.

It is perfectly possible to remove one or both tubes with or without the ovaries, or the uterus and its adnexa for pelvic inflammation by the vagina, and there are cases already enumerated in which this form of operation is preferable; but except in the infrequent instances presenting distinct indications for a vaginal operation, abdominal section for salpingitis is the more satisfactory, the safer, and the better operation. (For the technic of vaginal section see page 640.)

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[1] The author has examined women years after this treatment, finding a surprisingly good pelvic condition and a negative history of pelvic pain or discomfort.

EXTRA-UTERINE PREGNANCY.

By extra-uterine or ectopic pregnancy is meant the development of an impregnated ovum outside of the uterine cavity. The condition was described by Riolanus, Benedict Vassal (1669), and by Regnier de Graaf. Abdominal sections for extra-uterine pregnancies were performed by Nufer (1500) and by Dirlewang (1549). Bohmer (1752) differentiated the tubal, ovarian, and abdominal forms of ectopic gestation. Schmidt (1801) described interstitial pregnancy.

Frequency.—The exact proportion of extra-uterine to intra-uterine gestations is difficult to determine. It is said to be about 1 to 500. Winckel, however, saw but 16 cases in 22,000 births, and Bandl, in Vienna, but 3 out of 60,000. In the larger cities of America a considerable number occur annually I have operated on 13 patients for extra-uterine pregnancy in nine months

Classification Based upon the Situation of the Developing Ovum:

TUBAL.

Tubo-uterine, or interstitial. The ovum develops in that portion of the tube within the uterine wall

Tubal proper

Tubo-ovarian. The ovum is attached to the ovarian fimbria.

OVARIAN The ovum develops in a Graafian follicle.

ABDOMINAL. In primary abdominal pregnancy the ovum attaches itself to the peritoneal investment of the uterus, the broad ligament, or the intestines

Secondary Abdominal

Ovario-abdominal The ovum, beginning its growth in the ovary, pushes its way out into the abdominal cavity.

Tubo-abdominal. The ovum, at first contained in the tube escapes into the abdominal cavity by rupture, by a gradual separation of the fibers in the tubal coat, or by extrusion through the abdominal ostium There is a form of tubal pregnancy often called secondary abdominal or tubo-abdominal, in which the ovum grows downward and backward behind the peritoneum. This should be known as a broad-ligament or retroperitoneal pregnancy.

Utero-abdominal. The ovum grows at first in the uterine cavity, but, in consequence of a spontaneous rupture or separation of an old scar in the uterine wall, becomes an abdominal pregnancy, retaining its connection with the uterus by the placenta.

Etiology.—The causes of ectopic gestation are obscure.

Any disease of the mucous membrane of the tube depriving its cells of their cilia, forming mucous polyps, or otherwise obstructing its caliber, predisposes to an arrest of the impregnated ovum in its passage to the womb. So does any condition interfering with the normal peristalsis of the tube. Chronic salpingitis, therefore, is often found associated with and preceding tubal pregnancy.

Peritoneal adhesions constricting or distorting the tubes and congenital narrowness of their caliber may also obstruct the tubal canals. A diverticulum in the tube, an accessory tubal canal, accessory abdominal ostia, and atresia of the tube have been noted in connection with ectopic gestation. An exaggeration of the serpentine course characteristic of the tube may make the progress of the ovum difficult and may arrest it before it can reach the uterus Anything which increases the size of the ovum before it has emerged from the tube may be a cause of extra-uterine pregnancy; thus, external transmigration, twins, or an unusually long tube may result in such an abnormal growth of the ovum before its arrival in the uterine cavity that its progress is arrested and it is fixed in the tube The ability of the ovum to embed itself in mucous membrane and in subjacent tissue must also be considered in accounting for a tubal pregnancy.

Clinical History.—In each of the situations noted above the course of gestation may be somewhat different, and each may present an individual clinical picture on account of the difference in the surrounding anatomical structures The general presumptive signs of pregnancy are commonly the same as in intra-uterine gestation, but there is usually severe pain Extra-uterine pregnancy occurs oftenest between the twentieth and thirtieth years The youngest woman affected was fourteen, the oldest forty-seven years of age.

Changes in Uterus and Vagina.—In all the forms these changes are alike. Most of the alterations characteristic of intra-uterine pregnancy are found · hypertrophy of the vaginal mucous membrane, with increased blood-supply (purple tinge) and increased secretion, a soft cervix and a patulous os; an enlarged uterus, and, in the majority of cases, a development of a deciduous membrane, undergoing the same change as in intra-uterine gestation preparatory to its separation and extrusion, which occurs in extra-uterine gestation usually between the eighth and twelfth week, the membrane being expelled as a complete cast of the uterus and even of the tubes, or in shreds The usual clinical history of ectopic gestation is absence of menstruation until the death of the embryo or rupture of the sac, when the menses return with the discharge of the decidua. The metrorrhagia which thus begins may continue for a long time.

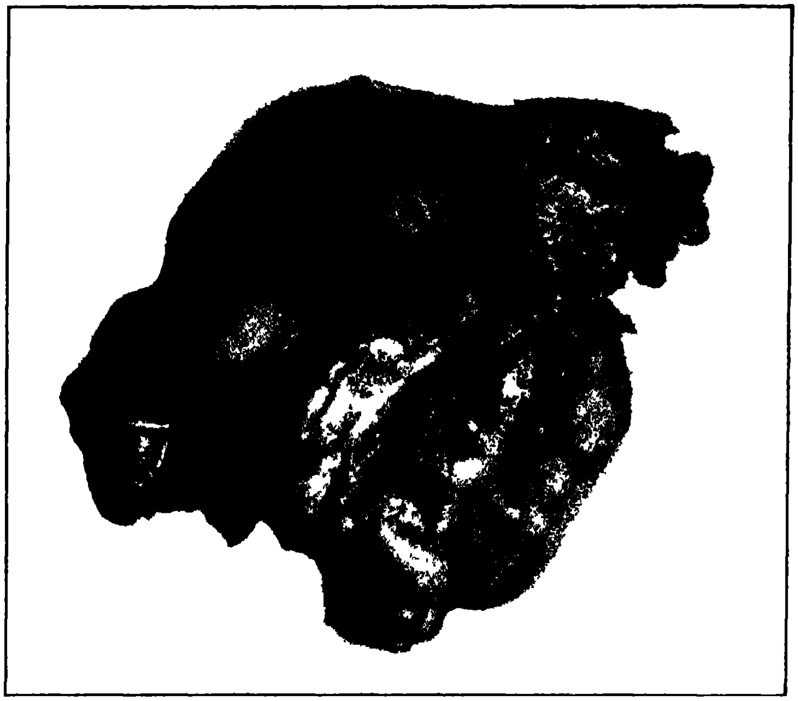

Fig. 392.—Tubal pregnancy, unruptured.

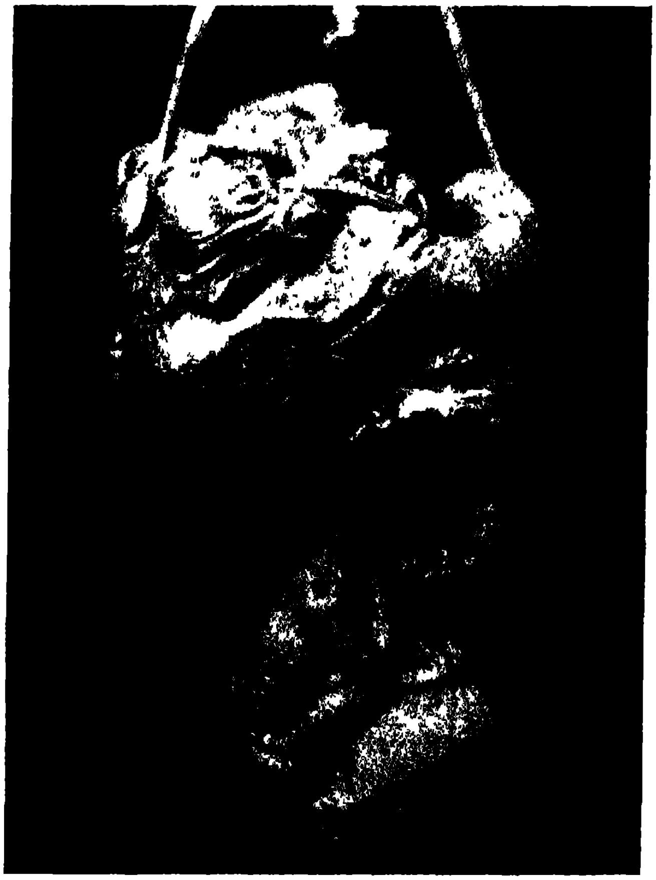

Fig. 393.—Ruptured tubal pregnancy and extrusion of embryo, contained in its amnion.

The other changes in the maternal organism may vary with the situation of the developing ovum.

Clinical History and Pathology of Tubal Pregnancy.—Usually the woman has had children, but a long time has elapsed since the birth of the last child. The most frequent situation of an extra-uterine gestation is the outer third of the tube (the ampulla[1]) In this position it may grow upward into the abdominal cavity, distending the tube-walls to the point of rupture, or it may grow downward between the layers of the broad ligament, and then backward and upward behind the posterior parietal layer of the peritoneum (broad-ligament gestation). The tubal walls grow thicker from the development of their muscle-fibers, except at spots, especially on the upper and posterior surfaces, where rupture may occur, the woman experiencing severe cramp-like pain, followed by symptoms of profound shock and death from hemorrhage, in a few hours Fever is often seen, sometimes to a high degree, even before rupture occurs The usual temperature, however, before rupture is between 99° and 100° F. Exceptionally the tubal gestation may proceed to full term (6 per cent of tubal pregnancies—Winckel) In these cases the ovule has probably at first grown downward and backward If rupture occurs, it usually takes place between the eighth and twelfth weeks, but it may be seen as early as the fourteenth day,[2] or after the sixth month. If the tube ruptures upon the upper or posterior aspect of the sac, the sac-contents are extruded into the peritoneal cavity with an intraperitoneal hemorrhage. If rupture occurs on the lower aspect, the contents of the ovum and the blood find their way between the layers of the broad ligament and the pelvic fascia, giving rise to an extraperitoneal hematocele. The first variety is usually fatal; the last is not always directly

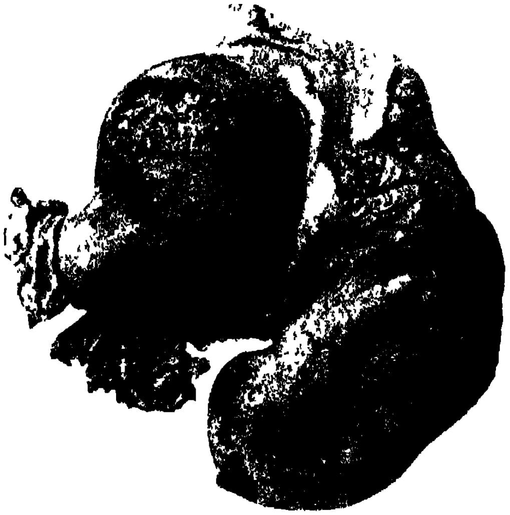

Fig. 394 —Ruptured tubal pregnancy.

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[1] Martin's statistics of 55 cases of extra-uterine pregnancy give this situation in 49

[2] Ross, "Amer Jour Obstet," October, 1895 According to Hecker's statistics of 45 cases, rupture occurred 26 times in the first two months, 11 times in the third, 7 in the fourth, and once in the fifth. In 2 of my cases rupture occurred no later than the fourteenth day.

dangerous to life, but the layers of the broad ligament may rupture when distended with blood, and the bleeding then becomes intraperitoneal and unlimited. The bleeding may also be limited by peritoneal adhesions shutting off the peritoneal cavity and forming a closed sac in the iliac region. From adhesions to intestines, complications, such as perforation and obstruction of the bowel, may occur.

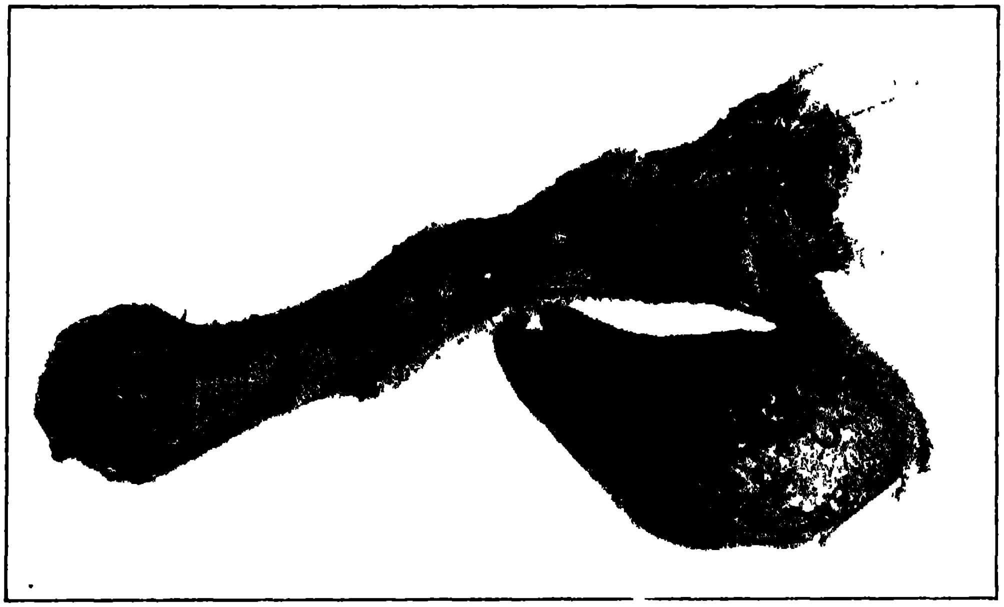

Fig. 395.—Ruptured tubal pregnancy in the cornual end of the isthmus, not further advanced than fourteen days. Enormous intra-abdominal hemorrhage Corpus luteum in opposite ovary. Internal transmigration of the ovum?

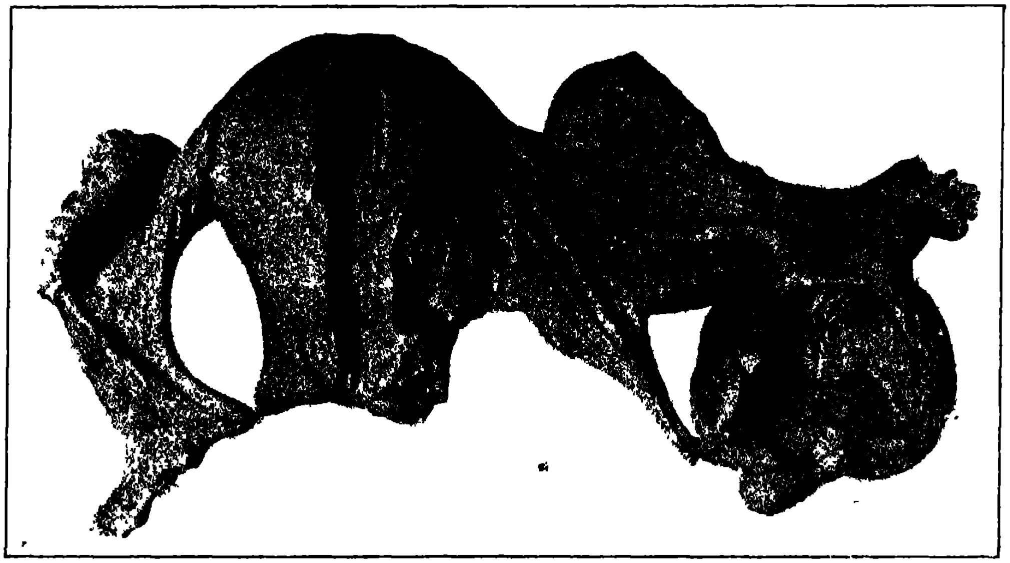

Fig. 396.—Ruptured tubal pregnancy.

The mucous membrane of the tube undergoes a change, being converted into a decidua, as in the uterus, but there are in the tube connective-tissue bundles between the decidual cells; the layers of the decidua are not well differentiated, and in the deepest layer muscle-fibers, connective-tissue bundles, and decidual cells are intermingled.[1] It has been asserted by many observers that there is no decidua reflexa in the tubal pregnancies, but Winckel

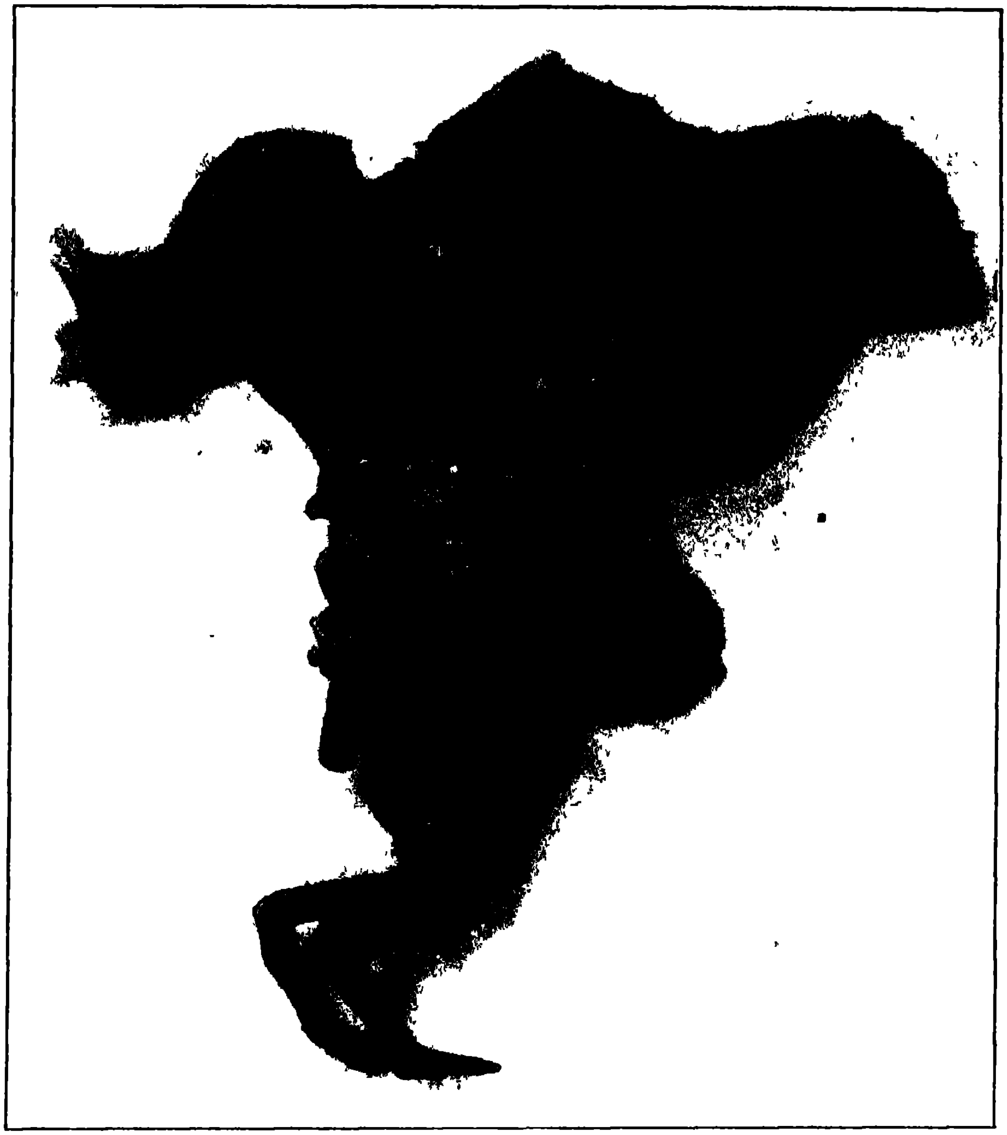

Fig. 397 —Tube and four months' fetus Tube injured during removal.

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[1] Kuhne and Kreisch claim that there is no decidua formation in the tubes and that the cells regarded as decidual cells are cells from Langhans' layer of the chorion villi. "Centralbl f. Gyn," No. 4, 1899, and "Monatsschr f. Geburtsh. u. Gyn," Bd. ix, H. 6.

has demonstrated it twice. The plications of the tubal mucous membrane are unfolded as the tube expands.

There may be multiple (twin or triplet[1]) extra-uterine gestation; coincident intra- and extra-uterine pregnancy; pregnancy first in one tube and then in the other; simultaneous pregnancies in both tubes;[2] or two successive pregnancies in the same tube.[3] Hydramnios was noted in one case of tubal pregnancy[4] and a thoracopagus was found in another.[5]

Clinical History of Interstitial Pregnancy.—In these cases the ovum develops in the uterine wall, the inner side of the sac often projecting into the uterine cavity, and having on its outer side the round ligament and the whole length of the tube The usual termination of this kind of ectopic gestation is rupture into the peritoneal cavity. Hecker collected twenty-six cases, all ending in rupture before the sixth month. Rupture into the uterine cavity and expulsion of the fetus through the cervix are possible. Rupture into or growth between the layers of the broad ligament is also possible.

Clinical History of Tubo-ovarian Pregnancy.—The ovum develops between the fimbriæ of the tube and the ovary The sac may rupture with the usual consequences of such accident. It is possible, however, to see a development of the fetus to maturity. The ovum may lodge upon the ovarian fimbria and may grow inward between the layers of the broad ligament.

Clinical History of Ovarian Pregnancy.—The ovum impregnated while it is still within the Graafian follicle reaches some degree of growth and development within the ovary The condition is exceedingly rare, but there are a few indubitable cases on record.[6] One case in Philadelphia, reported by Dr Baer, went to term. Muller and Widerstein have reported cases of the prolapse of a pregnant ovary into the inguinal ring and canal

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[1] Sänger, "Centralbl f Gyn," No 7, 1893 Krusen, "Tr Phila. Co. Med Soc," Oct, 1901

[2] Martin has collected 8 cases. "Zeitschr f Geburtsh u Gyn," Bd xxxviii, H 1

[3] Coe, "N. Y Med Record," May 27, 1893, Dorland, "Repeated Extra uterine Pregnancy," "Amer Jour. Obstet.," April, 1898, Royster, "Combined Intra- and Extra-uterine Pregnancy at Term," *ibid*, 1897, vol xxxvi, p. 820, Mosely, *ibid*, 1896, 38 cases of extra uterine pregnancy Zinke, *ibid.*, xlv, No 5, 1902, 88 cases Heinricius and Kolster report two fully developed fetuses in one tube, one macerated, the other well preserved; "Arch f Gyn," Bd lviii

[4] "Arch f Gyn," Bd xxii, S. 57

[5] "Centralbl f Gyn.," 1894, p 232

[6] Cases are reported by Potenko, Werth, Paltauf, Leopold, and Martin. See Winckel, "Geburtshulfe"; Kelly, article in "American Text-book of Obstetrics" Ludwig ("Wiener klin Wochenschr," 1896) has collected 18 cases besides 1 of his own. Leopold claims that there are 13 authentic cases recorded, "Arch f Gyn," Bd. lix. Catharine van Tussenbraek demonstrated a specimen removed by Kouwer, of Haarlem; "Tr. III Congress of Gyn and Obstet," Amsterdam, 1899. Indubitable cases are reported by Wathen and Franz ("Jahresbericht," 1902, vol. xv, p 780).

Clinical History of Abdominal Pregnancy.—Primary abdominal pregnancy is exceedingly rare. Many gynecologists deny its occurrence, but there have been a few authentic cases.[1] The conditions in the free abdominal cavity favor the progress of pregnancy to the mature development of the fetus. The peritoneum is converted into a decidua-like membrane wherever the ovum comes in contact with it, and from this source the chorion and placenta derive nutriment. The ovum is surrounded by a fibrous and vascular capsule. In abdominal and in advanced tubal gestation abortive labor-pains appear at term. The child dies at or shortly after this period, and the liquor amnii is absorbed after the death of the fetus. The abdomen is consequently reduced in size and the tumor is changed in consistency. The fetus may be converted into a lithopedion and may remain as an innocuous tumor in the abdomen for years. The child is likely to be small and ill-formed, but occasionally overgrown children are reported, no doubt on account of a prolongation of pregnancy In advanced cases of abdominal pregnancy the fetal movements are exceedingly painful to the mother. Abdominal pregnancies may end in rupture of the sac or there may be profuse hemorrhage into the sac cavity.

Clinical History and Pathology of Utero-abdominal Pregnancy.—This condition is very rare. The pregnancy is at first intra-uterine, but the ovum escapes into the abdominal cavity through an opening in the uterine wall, retaining a connection by the placenta with the uterine cavity. The process of extrusion must be gradual. These cases follow either a Cesarean section or a rupture of the uterus at a previous labor. The fetus may grow to full term.[2]

Terminations of Extra-uterine Pregnancy. — *Death and Absorption of the Young Embryo with Absorption of the Liquor Amnii, and Atrophy of the Gestation Cyst.*—Of all the terminations of ectopic gestation, this is the most favorable. It is exceptional, and should never be counted on in practice The embryo must die before the second month to be completely absorbed. At the best chronic salpingitis with adhesions persists, and therefore the woman may be left a chronic invalid

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[1] Schlechtendahl has reported a case of primary abdominal pregnancy in which a fetus 15 centimeters long was found encapsulated near the spleen. The tubes and uterus were normal ("Frauenarzt," 1887, ii, pp. 81-86) Braun's and Zweifel's cases ("Arch. f. Gyn.," Bd. xli, H 1 und 2), in which the placenta was attached to the posterior uterine wall and to the sigmoid flexure, and Koeberle's case, in which impregnation occurred through a vagino-abdominal fistula after hysterectomy, were unquestionably primary abdominal pregnancies

[2] "Ausgetragene secundäre Abdominalschwangerschaft nach Ruptura uteri, im vierten Monat," Leopold, "Arch f Gyn.," lii, 2, 376. Fullerton, "Annals of Gyn," Oct, 1891

Rupture of the sac and profuse hemorrhage occur most commonly in tubal gestation, when the growth is upward toward the abdominal cavity. The rupture may occur when the ovule grows downward between the layers of broad ligament; also in tubo-uterine, tubo-ovarian, ovarian, and abdominal pregnancies. The accident commonly destroys the embryo, which may escape into the abdominal cavity. Up to the second month the extruded embryo may be absorbed. Later, it may be found lodged among the intestines, perhaps far removed from the pelvic organs and usually surrounded by clotted blood.[1] The hemorrhage may be fatal in as short a time as two hours; it usually takes from eight to sixteen hours, however, for the woman to bleed to death. The hemorrhage may be fatal as late as the second, third, or fourth day, or there may be successive hemorrhages, perhaps days apart until the patient is gradually exhausted or is suddenly destroyed by an unusually profuse outpour of blood. Surprisingly small tubal gestation sacs may, on rupture, give rise to fatal hemorrhage. The determining cause of rupture is not always apparent. It may occur while the patient is lying quietly in bed, but may follow the straining of defecation or urination, coitus, a blow upon the abdomen, a gynecological examination, an operation like curetment, or any sudden physical effort or mental excitement. The rupture may be due to contraction of the tube-walls, to menstrual congestion, or to the steady growth of the tumor. Rupture of the sac or of a blood-vessel in its wall, with profuse hemorrhage, has occurred long after the destruction of the embryo and cessation of growth in the sac (two years in one case)

Rupture of sac with extrusion of its contents, and interstitial hemorrhage into its sac-walls, without escape of blood into peritoneal cavity or between the layers of broad ligament, was the termination of one case of tubal gestation under my observation. This occurrence might be followed by atrophy of the ovum and sac.

Tubal moles are frequently seen as the result of an old tubal pregnancy; the ovum is infiltrated and surrounded by blood, clotted and often organized. The tubal walls are also infiltrated with blood and are much thickened. The whole mass constitutes a solid tumor of the tube in which the embryo may not be found, and atrophied chorion villi in small numbers are only discovered after a careful microscopical search.

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[1] Burford reports an extraordinary case in which the tube ruptured, the fetus was extruded through the rent, the cord was torn across, and the fetus with the cord attached was found in the abdominal cavity inclosed in an adventitious sac. The placenta remained in the tube, and the rent in the latter, through which the fetus escaped, had healed. "Brit. Gyn Jour.," 1892

Growth of the Fetus after Third Month; Its Death at or before Maturity and the Changes that Occur Afterward.—A continued development of the fetus in the later months of pregnancy is seen most often in abdominal or in tubo-ovarian pregnancies, though it is possible in the tubal gestation with retroperitoneal growth (broad-ligament pregnancy) The fetus after death may be converted into a lithopedion or may be mummified, and in these conditions may remain in the abdominal cavity indefinitely (in Sappey's case fifty-six years), or may be removed by operation through the abdomen, vaginal vault, or possibly by the rectum. The soft parts may macerate and may be absorbed, leaving the bones, which remain as an innocuous abdominal tumor or ulcerate into the bladder, intestines, or through the anterior abdominal wall Ulceration into the bladder is a particularly unfortunate complication. I have seen an old lady die of peritonitis caused by the ulceration of a parietal bone through the transverse colon. Her history indicated an abdominal pregnancy having its origin many years before.

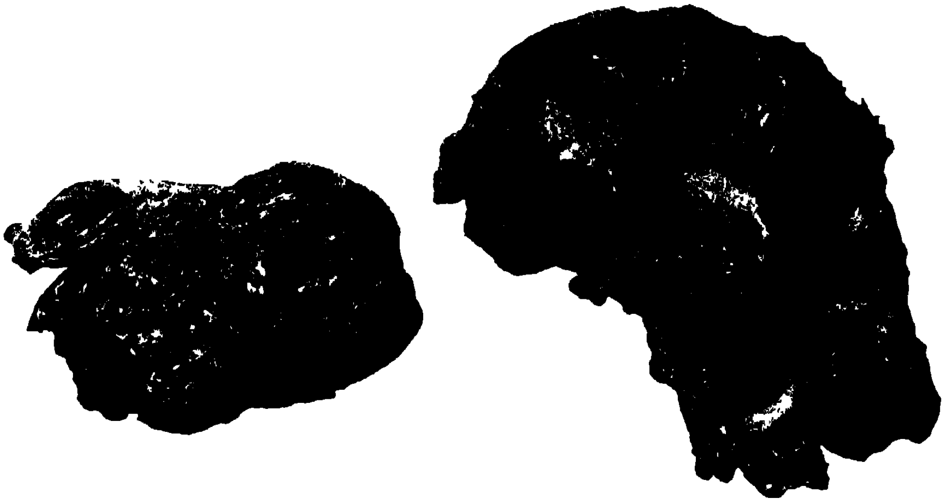

Fig 398.—Tubal abortion and extruded mole.

The fetal body may putrefy from the contiguity of the intestines and their contained micro-organisms and the consequent access of bacteria to the highly putrescible sac-contents In the same way the gestation sac is converted into an abscess.

Terminations of Ovarian Pregnancy.—There may be an arrest in the development of the ovum at an early period. In one case the small, cystic, ovarian tumor containing the fetal bones was retained in the abdomen for years. In another case the fetus went on to full development, then died, and was removed in a good state of preservation at least one year later. Rupture of the sac and profuse hemorrhage may occur.

In *tubo-uterine* or interstitial pregnancies the ovum and embryo may be discharged into the uterine cavity, and may be evacuated by the vagina. There are at least two such cases well authenticated. Rupture of the sac and hemorrhage into the peritoneal cavity are, however, the rule. In Maschka's case the head of the fetus passed into the abdominal, the breech into the uterine, cavity

In cases of so-called *tubal abortion* (so named by Werth) there is an internal rupture of the tubal wall or of its connection with the ovum, and blood is poured through the fimbriated extremity of the tube into the abdominal cavity. The blood-clots filling the pelvis in such a case may have a peculiar sausage-like form imparted to them by the tubal canal The whole ovum may possibly be extruded through the abdominal orifice of the tube, as in two cases of the author's (Figs. 398, 399), and in one case in which the fimbriated extremity was closed by inflammatory adhesions the outer end of the tube was converted into a hematoma. Kustner claims that tubal abortion is much more frequent than rupture. In 75 cases the former occurred 59, the latter 16, times.[1] The majority of the cases under the author's observation have ended by tubal abortion.

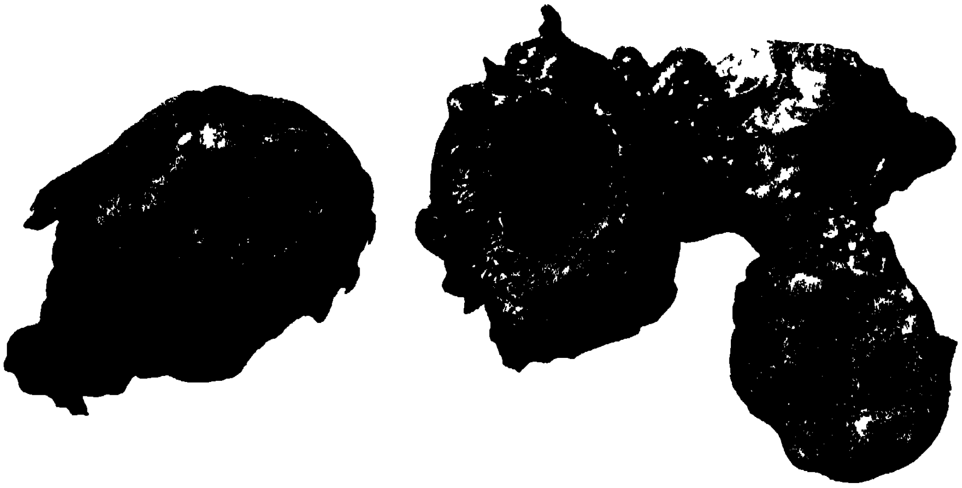

Fig 399.—Tubal abortion and extruded mole

It is possible that a tubal pregnancy may rupture in its early stages, the embryo be expelled into the abdominal cavity, retaining its connection with the tube by the cord and placenta, and the fetus thus continue to further or to full development. This is called a *secondary* or *tubo-abdominal pregnancy.*[1] Rupture in cases apparently of this character may not have occurred. There may have been a retroperitoneal growth of the ovum and an enormous dilatation of the tubal walls. Tuholske[2] reports a case in which the ovum was extruded from the abdominal ostium, became attached to the diaphragm, and developed between the right lobe of the liver and the right kidney.

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[1] "Volkmann's Samml. klin Vortrage," N F, Nos. 244, 245

Growth and development of the placenta after fetal death has been described, but has not yet been demonstrated beyond doubt. It would seem impossible, arguing from the behavior of the placenta *in utero* after fetal death.

Profuse hemorrhage into the gestation sac, forming a large hematoma, occurred in one case under my observation.

Hematoceles and hematomata in the abdomen, pelvis, and pelvic connective tissue in one-third or more of the cases are due to the hemorrhage from a ruptured gestation sac. The blood may collect in front of the uterus (ante-uterine hematocele), more commonly behind the uterus (retro-uterine hematocele), may be encapsulated in the neighborhood of either broad ligament, or may be contained in the pelvic connective tissue on either side of the uterus. These accumulations of blood may suppurate, and may thus prove fatal They may be evacuated by puncture through the abdomen or often through the vaginal vault. If not too large, they are absorbed

Symptoms of Extra-uterine Gestation.—The Subjective Signs.—In the early weeks or months the subjective signs of ectopic pregnancy may be indistinguishable from those of normal intra-uterine gestation In the tubal variety, which is by far the commonest, there may be no indication of any abnormality until rupture occurs. In the vast majority of cases, however, rupture is preceded by severe cramp-like pains, usually in one or the other iliac region, often accompanied or followed by the discharge of deciduous membrane and by metrorrhagia.

The pain of extra-uterine pregnancy is its most distinctive symptom. It may be defined as a pain described by the patient in strongest terms; occurring in paroxysms, with intervals free from suffering; appearing at any time from a few days to months after a normal menstruation; situated often in one groin, though frequently indefinitely referred to the lower abdomen; extending down one leg or up to the epigastrium; and a pain so severe as to occasion profound systemic disturbance—syncope, followed by nausea and vomiting, a cold sweat, hysterical outbreaks, complete disability, and every appearance of excessive shock. The temperature is almost always slightly elevated. There may be high fever, and the general health may be much impaired. When advanced development occurs, as in abdominal and in some cases of tubal gestation, no symptoms may arise until the time for labor has passed, when pain and other complications, due to the peculiar character of the abdominal tumor, may appear. There is usually cessation of menstruation for one or two periods; then a return of the flow as an irregular bleeding, which may last for months. In some cases irregular bleedings begin with conception and last until rupture; there is no cessation of menstruation. In others, one period is slightly delayed; those after and before are normal. Again, the delayed period may be unnatural in character. In exceptional cases the menstruation occurs at the normal time, but is more profuse or scantier than normal. In 59 cases upon which I have operated there was no absence of menstruation in 17; a cessation of menstruation varying from ten to ninety days in 42. There was metrorrhagia lasting from two to one hundred and twenty days in 41 cases; there was a discharge of decidua in 25 cases.

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[1] Lusk has collected three such cases The fetus survived the rupture of the tube, or the extrusion may have been gradual by a separation of the fibers in the tube-wall

[2] "Am. Gyn. Jour," Dec, 1901. Abstr in "Jahresbericht ü. d Fortschr. a d Gebiet d. Gyn. u. Geb," 1902, p 779

Other symptoms noted have been irritable bladder or dysuria; marked constipation or even obstruction of the bowels if the tumor is on the left side, edema of the corresponding limb and aching pain in it, especially at the groin; or numbness and loss of power. Pulsating vessels may be felt in the vaginal vault.[1]

Objective Signs.—In tubal pregnancies an exquisitely sensitive tumor may be felt to one side of, behind, or possibly in front of the uterus, quite firmly fixed after the third or fourth week, and doughy in consistence.[2] The uterus is much smaller than would be expected from the duration of the pregnancy. After the third month ballottement may possibly be practised upon the tubal tumor. The uterus is usually displaced forward, backward, or to the side opposite the tumor. The decidua is expelled from the uterus in a large proportion of cases (42 per cent. of my own). If the discharged membrane can be obtained, it will present, under the microscope, unmistakable characteristics of decidua. It may be extruded in fragments or as a complete cast of the uterus.

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[1] Hofmeier claims that the pulsation of arteries on one side of the cervix and not upon the other is a valuable sign of extra-uterine pregnancy; and, moreover, that it is a sign of life in the ovum, ceasing when the embryo dies and the ovum stops growing

[2] For three or four weeks the tubal tumor is free; quite suddenly it sinks into the pelvis from its increasing weight, and wherever it comes in contact with the pelvic peritoneum the latter is changed into a decidua-like structure to which the tube-walls adhere.

Symptoms of Interstitial Pregnancy.—A diagnosis is difficult or impossible. The uterus enlarges to a greater degree than in any other variety of ectopic gestation, and it may be impossible to determine whether or not it is symmetrically enlarged. The condition is recognized after an abdominal section, upon a careful intra-uterine exploration, or after rupture of the sac.

Abdominal pregnancy may be recognized when the ovum occupies Douglas's pouch, as the fetal parts may be made out with startling distinctness through the posterior vaginal vault. A sacculated uterus, however, might easily be mistaken for an abdominal pregnancy.

Diagnosis.—A diagnosis of extra-uterine pregnancy can usually be made before rupture. In spite, however, of careful attention to the patient's history and a painstaking physical examination by an expert, a diagnosis before rupture is sometimes impossible. Usually the condition is not recognized in general practice until rupture has occurred. At this time a history of early pregnancy, a paroxysm of frightful pain, sudden collapse, symptoms of internal hemorrhage, with abdominal distention, and a vaginal examination showing a pelvic tumor with possibly the physical signs of effusion into peritoneal cavity, make the diagnosis perfectly clear, and indicate an immediate celiotomy. These symptoms have been closely simulated by rupture of a varicose vein in the broad ligament, by rupture of an ovarian cyst or torsion of its pedicle, by acute suppurative salpingitis, by criminal abortion followed by infection, in which a false history is purposely given, and by pelvic tumors coincident with intra-uterine pregnancy But as all these conditions demand the same treatment, a mistake in the differential diagnosis between them is of no consequence If the cramp-like pains of ectopic gestation lead a patient to consult a physician; if she give a clear history of impregnation; if she present all the earlier signs of pregnancy, with the discharge of blood and membrane which the microscope shows to be decidual; if there is a very sensitive tumor in the neighborhood of the uterus on which ballottement may, perhaps, be practised, and if the uterus is not so large as it should be, the diagnosis is justified, and the necessary treatment, also, involving, as it does, a serious operation. Among the conditions in the pelvis that may make the diagnosis impossible are: abortion, in consequence of or coincident with some growth near the uterus; pyosalpinx, with an indistinct or untrustworthy history of pregnancy; intra-uterine pregnancy, with rapid development of a fibroid on one side of the uterus; development of an impregnated ovule in one horn of a bicornate uterus, or on one side of a double uterus. A common error constantly occurring in general practice is to *mistake an extra-uterine pregnancy for an incomplete abortion. I find in my notes of fifty-nine cases this mistake made by the* attending physician in twenty.

Prognosis.—Without surgical treatment about two-thirds of the cases die; one-third escape the immediate danger of death.[1] Treated by abdominal section, the mortality should be about 5 per cent., or lower if the operator sees the patient in time. I have performed 59 operations with three deaths. Two of the fatal results were in women already exsanguine, who died a few hours after the operation without regaining consciousness. The other was in a chronic drunkard, who died on the fifth day from cirrhosis of the liver. Of those patients who do not die directly in consequence of the tubal gestation a large proportion remain invalids, and many die at a remote period from various complications, as bowel obstruction, ulceration, suppuration, or hemorrhage.

Treatment.—As soon as the diagnosis is established with reasonable certainty, whether the sac has ruptured or not, the removal of the gestation sac by celiotomy is the only treatment worthy of consideration. Electricity is an uncertain and unreliable remedy, and the recoveries ascribed to its use are the result of nature's effort to effect a cure. Injections into and puncture of the sac to destroy the embryo should be relegated to the category of discarded and discredited procedures.

Abdominal section is the only reliable and trustworthy plan of treatment. The removal of a gestation sac and the control of hemorrhage is sometimes a difficult operation, not to be undertaken rashly by an unskilled operator. In favorable cases in which a trained nurse is kept in constant attendance, and in which the physician can reach the patient quickly, in exceptional cases it might be justifiable to wait, after diagnosticating extra-uterine pregnancy before rupture, for the death of the embryo and the atrophy of sac, which will occur in about one-third of the cases As a rule of practice, however, the only safe plan is either to operate immediately one's self, or to refer the patient to a competent surgeon without delay.

After rupture, the patient's only hope lies in an immediate abdominal section, evacuation of the blood from the peritoneal cavity, the ligation of the blood-vessels supplying the sac, and its complete removal.

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[1] In 265 cases without surgical intervention, 36.9 per cent. recovered, 63.1 per cent. died (Winckel's "Geburtshulfe," 2. Aufl., S. 254) In 100 cases collected by Kiwisch, the mortality was 82 per cent; in 132 collected by Hecker, 42 per cent; in 130 by Hennig, 88 per cent; in 500 cases collected by Parry up to 1876 the mortality was 67.2 per cent; in 626 cases collected by Schauta, from 1876 to 1890, 241 ended spontaneously, 75 in recovery, and 166 in death, a mortality of 68.8 per cent. Martin states that of 585 cases operated upon, 76.6 per cent. recovered ("Centralbl f. Gyn.," No. 39, 1892)

The Technic of Abdominal Section for Tubal Pregnancy.—The operation is often performed in an emergency, and must, therefore, be hurried. Plenty of time, however, should be taken to secure an absolutely aseptic condition of the field of operation in the patient, of the surgeon, assistants, dressings, and implements. If possible, the patient should be transported to a well-appointed hospital. If there has been much bleeding and the patient's condition is bad, the anesthesia should be limited and the operation should be finished in the fewest minutes possible. It is possible to conclude the operation, to the last abdominal stitch, in less than eleven minutes and with less than an ounce of ether.[1] No attention should be paid to the blood that gushes in enormous quantities from the abdominal cavity when the peritoneum is incised. It has already been shed and is of no use to the patient. The side affected should have been learned by the history,[2] if not by the physical signs. This tube should at once be grasped between the thumb and fingers of one hand, the broad ligament should be transfixed by a pedicle needle to the inner side of the round ligament, and ligated *en masse*,[3] with three turns of the silk ligature, one to each side of the pedicle needle, the third around the whole stump The tube and ovary are then cut away. The abdominal cavity should next be flushed with a large quantity of sterile water [4] Drainage is rarely necessary. The author has not drained a case for four years or more, though formerly he drained every one. If drainage is deemed necessary, the abdomen should be drained with both a glass tube and gauze packing.

For twelve or twenty-four hours after the operation vigorous stimulation and an active treatment for the acute anemia are necessary if there has been a profuse hemorrhage. Submammary or intravenous injections of normal salt solution are invaluable. If drainage is employed, the glass tube is sucked out by a syringe once a day with strictest aseptic precautions. The gauze is removed at the end of forty-eight hours, and the glass tube is then withdrawn after a rubber tube is slipped within it to take its place. Through the rubber tube the pelvic cavity is irrigated once a day with sterile water. The irrigation is continued for about ten days, or until the water returns perfectly clear without bringing with it small snowflake-like clots and the débris of the deciduous formation on the peritoneum which constitute the adhesions between the tubal sac and surrounding intraperitoneal structures.

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[1] A patient was at first treated by her physician for a miscarriage—the commonest mistake in the diagnosis of extra-uterine pregnancy. After rupture the true condition was recognized, but the woman was so reduced by the internal hemorrhage that she was pronounced a hopeless case, and the physician left the house late at night saying he would call the next morning to sign her death certificate. To his surprise he found her alive. A few hours later I operated on her with success, though she was pulseless and in as desperate a condition as possible

[2] It is often impossible to tell from a physical examination which tube is involved, but I have found the history of pain down one leg and not the other of great value in diagnosticating the side affected.

[3] It is waste of invaluable time in the majority of cases to ligate the blood vessels separately.

[4] I have practically given up douching the abdominal cavity after abdominal sections, except in extra-uterine pregnancy. There is no other means which so rapidly and surely removes blood-clots from the abdomen It is, moreover, a great advantage to leave the large quantity of hot water which remains in the abdominal cavity after irrigation Gallons are required and it is inconvenient to prepare such a quantity of normal salt solution. There is, moreover, no great advantage in the use of salt solution.

The vaginal operation for tubal pregnancy in the first three or four months is, as yet, in its infancy. It has the serious disadvantages that, on account of uncontrollable hemorrhage, a vaginal hysterectomy or hasty abdominal section may be necessary, and if the tube is simply incised and not removed, a diseased and useless pelvic organ is left behind to be a source of future trouble. It is impossible through a vaginal incision to evacuate the blood and blood-clots lying in large quantities in remote portions of the abdominal cavity. Moreover, as in all vaginal sections, nicety and precision of work is impossible through the vaginal vaults.

In *interstitial* pregnancy, on account of the difficulty of diagnosis, little can be done until rupture and hemorrhage have occurred, when an abdominal section must be performed. The sac should be cleared of all its contents, and its edges should be sewed to the abdominal wall; after the bleeding vessels are secured, the sac should be drained. If this technic is impossible, ligation of the uterine and ovarian arteries is indicated, drainage of the sac, or possibly supravaginal amputation of the uterus. It might be well, the diagnosis being clearly established, to try to effect evacuation of the gestation sac into the uterine cavity after thorough dilatation of the cervical canal. A mistaken diagnosis, however, would lead to a premature termination of a normal intrauterine pregnancy. Tait describes a case in which he found it possible to incise the sac, turn out its contents and drain it, after fetal death.[1] Engström treated a case successfully by incising the uterine wall, extracting the dead fetus and its appendages, making and enlarging an opening between the gestation sac and the uterine cavity, sewing the uterine wall firmly together, as after a Cesarean section, and closing the abdomen without drainage.[2]

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[1] London "Lancet," 1894, I, p. 38

[2] "Centralbl f. Gyn.," No. 5, 1896.

Ovarian pregnancy is to be treated as a tubal pregnancy—namely, by excision of the sac with the ovary. As a matter of fact the operation is undertaken in these rare cases for an ovarian tumor, and the operator discovers, to his surprise, after opening the abdomen, the contents of the ovarian cyst.

In advanced extra-uterine pregnancy the operator should delay interference until just short of term, or until the beginning of false labor pains, when the fetus and, if possible, the fetal sac, should be enucleated and extracted whole. The uterine and ovarian arteries are previously ligated. It is not infrequently necessary to cut the cord off short, stitch the sac-wall to the abdominal wall, and drain the sac. Forty operations (1889–1896) after the seventh month of gestation, with living and viable infants, have been collected by Dr. R. P. Harris[1] In this number there were ten maternal deaths, twenty-seven infants survived the operation. Von Both has collected 83 cases; in the first 30 operations there were 25 deaths; in the 53 following, 15; and in the last 8 operations, only 1.[2] Sittner[3] has collected 126 cases, with 51 recoveries and 10 deaths since 1880. *When death of the fetus has occurred*, it is best not to subject the woman to the danger of the several possible ultimate terminations, but to perform celiotomy and to remove the fetus and its entire surrounding sac. If the exsection of the sac is too difficult or dangerous, it is permissible, some weeks after fetal death, to cut the cord off short, leaving behind the atrophied remains of the placenta. If this is done, the sac-wall should be stitched to the abdominal wall, and thus drained for a length of time until the placenta comes away. Meanwhile daily irrigations are required and antiseptic powders may be dusted in the sac-cavity. In case the gestation sac is low down in Douglas's pouch, bulging the posterior vaginal wall, vaginal section, and the delivery of the fetus by the natural passage may be considered; but the dangers and disadvantages of the vaginal operation should be carefully weighed. These are: difficulty of extracting the fetus, if it is large; uncontrollable hemorrhage, puncture of an intestine, infection of the general peritoneal cavity, either at the time of the operation or in subsequent irrigations of the sac, and adhesions involving the uterus and appendages after the woman's recovery from the operation.[4] Vaginal section is preferable in case of an old gestation sac undergoing suppuration and containing a much macerated or disintegrated fetus. In some cases of intraligamentary pregnancy it is possible to open the sac extraperitoneally by an incision above Poupart's ligament. It is always advisable, however, to make a preliminary abdominal section to learn the relations of the gestation sac.

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[1] Kelly's "Operative Gynecology," vol ii.

[2] "Centralbl. f Gyn.," No. 15, 1899.

[3] "Arch. f. Gyn.," Bd lxiv, H. 3.

[4] For a good bibliography of the removal of extra-uterine fetuses through the vagina and by the rectum see J. T. Winter, "Amer. Jour. Obstet.," 1892, p. 34.

Pregnancy in One Horn of a Uterus Bicornis or Unicornis.—Pregnancy in an ill-developed horn of a uterus unicornis may exactly resemble a tubal or interstitial pregnancy, and will probably end in rupture at the apex of the cornu.[1] This is particularly true if the impregnated ovule develops in a rudimentary horn, in which the conditions are almost the same as in a tube, except that rupture takes place later. On the other hand, a pregnancy in a uterus bicornis may terminate prematurely, or even at term, by expulsion of the fetus through the vagina.

The diagnosis of pregnancy in a uterine horn is difficult or impossible It is mistaken, usually, for tubal gestation. The removal of a gestation sac in a rudimentary uterine horn is commonly easy, as a convenient pedicle is formed by its attachment to the lower segment of the better formed half of the uterus.

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[1] Three cases of pregnancy in rudimentary horns are reported by Turner, Werth, and Solin (Lusk's "Obstetrics") Kussmaul collected 13 cases, Manierre, 39, 24 of which ended fatally by rupture ("Amer Gyn and Obstet Jour ," vol. xv, No 3). Krull reports 4 and Ries 1 ("Arch f Gyn ," Bd lxii, H 3, and "Amer Jour of Obstet ," Jan , 1901

PART IX.

DISEASES OF THE OVARIES.

THE ovary, the distinctive sexual organ of woman, is a gland secreting eggs during the period of sexual activity, from about the fifteenth to the forty-fifth year. It is an elliptical shaped structure 3–5 cm. long, 1.5–3 cm. broad, 0.5–1.5 cm. thick, and weighs 6–8 grams. It is attached to the posterior surface of the broad ligament by the mesovarium, a reduplication of the peritoneum on the posterior surface of the broad ligament containing blood-vessels, lymphatics, nerves, and connective tissue entering the interior of the ovary at the hilus. There is a free convex margin of the ovary opposite the hilus, a median and a lateral free surface, a uterine pole to which the ovarian ligament is attached, a tubal pole to which the ovarian fimbria is attached. The ovary is the only structure projecting into the peritoneal cavity not covered with peritoneum. There is a visible line on the mesovarium—Farre's line[1]—dividing the peritoneum from the cells covering the ovary. The latter are columnar, resembling the epithelium of mucous membrane. From these cells, according to the generally accepted theory, are derived the egg cords, or Pflüger's tubes, which are columnar extensions of epithelium into the ovary, dividing into spherical spaces by the constriction and ultimate complete division of the tubes in their length. There are two layers in the ovary, distinguishable macroscopically, the cortical and the medullary. In the former are the follicles and ova set in a stroma of connective tissue; in the latter, blood-vessels, lymphatics, nerves, connective tissue of a looser structure than in the cortical layer, and unstriped muscle-fibers. Microscopically under the epithelium covering the ovary is a fibrous connective-tissue capsule, the albuginea, containing unstriped muscle-fibers. The albuginea is firmly adherent to the parenchyma beneath. In the cortical layer under the microscope are seen numerous small follicles and deeper within the stroma larger ones. These follicles, formed in the manner already described, from Pflüger's tubes, consist at first during fetal life of an aggregation of cells around one cell specially developed, the ovum, without a capsule or liquid secretion. Later in the development of the follicle there is a capsule (*theca folliculi*), a regular arrangement of cells around the interior (*membrana granulosa*), a heaped-up pile of cells in one portion of the periphery (*discus proligerus*), surrounding a highly specialized cell, the ovum.

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[1] Farre, A., "Uterus and its Appendages," Todd's "Cyc. of Anat. and Physiol.," vol. v, London, 1835–1858.

The fully developed follicle is called a Graafian follicle.[1] It is 0.5–2 cm. in diameter, and is visible as a thin-walled cyst projecting from the surface of the ovary. There are 18 to 20 of these fully developed follicles of various sizes in an ovary. There is a vast number of the smaller undeveloped follicles in the superficial portion of the cortical layer. It is estimated that the two ovaries contain in round numbers 100,000 ova. As a follicle is distended by an accumulation of liquor folliculi and increases in size, it appears to retreat into the interior of the ovary, for it must find additional room and seeks it in the direction of least resistance. It also pushes out onto the free surface of the ovary by bulging out the albuginea.

The arteries of the ovary are derived from the ovarian and the ovarian branch of the uterine. They enter at the hilus and are ultimately distributed around the follicles as a capillary network.

The veins leaving the hilus empty into the pampiniform plexus. Between the layers of the mesovarium there is a large venous plexus richly supplied with unstriped muscle-fibers, the *bulbus ovarii*, which is, in effect, erectile tissue.

The lymphatics leave the follicles with the veins and empty eventually into the lumbar glands in front of and alongside the aorta. The nerves are derived from the plexus of the ovarian artery; they supply the blood-vessel walls, but there are reflex and sensory fibers in addition to the vasomotor nerves. The ovary lies normally in a depression on the lateral pelvic wall, the ovarian fossa, which is the posterior portion of the obturator fossa. The ovarian fossa is bounded behind by the ureter and the uterine artery, above and in front by the umbilical artery. There is sometimes a distinct pouch of peritoneum on the posterior surface of the broad ligament in which the ovary lies as though in a pocket; there is often at least an indication of this arrangement which uniformly exists in the lower animals.

The topographical relation of the tube and ovary is important. The former runs first a horizontal course, is then directed upward and next downward and backward so that the fimbriæ are spread over the tubal pole and free median surface of the ovary, often concealing it completely.

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[1] Regnerus de Graaf, "De Mulierum organis generationis inservientibus," tractatus novus, 1672.

The ovary is supported and maintained in its normal position by the mesovarium, the infundibulopelvic or suspensory ligament, the ovarian ligament, and the ovarian fimbria of the tube.

In the neighborhood of the ovary, between it and the tube in the mesosalpinx, are three important and interesting remnants of embryonal structures—the parovarium or epoöphoron, the paroöphoron and Gartner's canal, the remains of the Wolffian body and its duct. The parovarium consists of 6 to 12 little ducts running parallel with one another and emptying at right angles into a common duct (Gartner's canal) running parallel with the tube. This duct ends in a blind sac, but there is often an indication of its continuance in the broad ligament, and in rare instances a patent canal has been traced to the uterine wall, to the vaginal vaults, and along the lateral vaginal walls to the introitus. The walls of the ducts of the parovarium and of Gartner's canal are composed of connective tissue and, it is claimed by some, unstriped muscle-fibers. The internal lining is ciliated epithelium.

The paroophoron is a microscopical structure lying to the inner side of the parovarium, composed of rounded bodies which are in part blind canals, in part distinct glomeruli like those of the Wolffian body. In fetal life and in early infancy the paroophoron is visible to the naked eye. Its histological structure is the same as that of the parovarium.

The function of the ovary is to develop, nourish, and set free the ova, by a process called ovulation. The Graafian follicles of greatest development, largest size, and protruding farthest into the peritoneal cavity under the stimulus of congestion either at time of menstruation or as a result, perhaps, of coitus, secrete a still greater amount of liquor folliculi, increasing the intrafollicular pressure to an extreme degree. At a point on the theca folliculi of greatest prominence on the free surface of the ovary a degenerative process occurs until at this spot, the stigma, rupture takes place, setting free the liquor folliculi, the discus proligerus, and the ovum, which are discharged with considerable force as the intrafollicular pressure is suddenly decreased by the rupture of the theca folliculi. The discus proligerus and ovum are often situated just below the stigma, but they may occupy a situation opposite to it or at any point on the periphery of the follicle.

The ovum, escaping from the ovary, surrounded by its discus proligerus of epithelial cells, is caught in the current of fluid caused by the lashing of the cilia in the tube and is carried into the tubal canal or it may be discharged directly into the ampulla and be caught at once by the cilia of the tubal epithelium. After the evacuation of a ruptured Graafian follicle a peculiar process is observed resulting in the formation of the so-called corpus luteum or yellow body. The internal layer of the theca folliculi is enormously thickened and thrown into numerous folds which eventually fill the whole space in the interior of the follicle. This structure is composed microscopically of lutein cells (large, hexagonal cells like liver-cells, containing a yellow substance, lutein, soluble in alcohol), fat globules, and ray-like extensions of fibroconnective tissue septa.

It is a disputed point whether the lutein cells are derived from the internal layer of the theca folliculi or the epithelium of the membrana granulosa.

In case of pregnancy the yellow body is larger and lasts longer than it does if impregnation fails to occur. In from thirty to one hundred and twenty days the lutein cells undergo hyaline and fatty degeneration and are absorbed; the theca folliculi and the connective-tissue extensions into the lutein cells shrink into scar tissue (corpora albicantia or fibrosa), the site of the corpus luteum being marked by a depression and a cicatrix; in turn the corpus fibrosum undergoes hyaline degeneration and is absorbed.

The purpose of the yellow body, as pointed out by Clark[1] and Waldeyer,[2] is to preserve the equilibrium of the circulation of the ovary and to maintain the normal intra-ovarian pressure.

Displacements of the Ovary.—The ovary is not very mobile It does not often leave its normal position on the lateral pelvic wall for an extensive excursion in the pelvis or abdomen, although attached to such easily movable structures as the broad ligaments and uterus. Under certain conditions, however, a wide arc of movement is possible, but the anomalous position thus acquired by the ovary is pathological. In salpingo-oöphoritis the ampulla of the tube is usually displaced downward, backward, and inward, necessarily carrying the ovary with it. In retroflexion of the uterus the ovarian ligament pulls the ovary in the same directions. Prolapse of the uterus may also drag the ovary down. Tumors of the pelvic organs may cause remarkable alterations in the size, shape, and position of the ovary. Inflammatory adhesions may fix it in odd places in the abdominal cavity. For example, it may adhere to the omentum, the parietal peritoneum, or the intestines at a high level if an inflammation occurs in or around it during the early puerperium. As the uterus descends in the course of involution the ovary can not follow it, but remains fixed, possibly far above the pelvic brim The normal descent of the ovary in fetal life may fail to occur and it remains at the high level it occupies in the young embryo.[1] But in all these conditions the malposition of the ovary is of secondary importance. There are only two displacements of the ovary which of themselves require recognition and treatment—prolapse, or descent into Douglas's pouch, and hernia of the ovary into the thigh, the groin, through the pelvic diaphragm, the thoracic diaphragm, the sciatic and obturator foramina, and the umbilicus.

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[1] "Arch f Anatomie u. Physiologie," 1898.

[2] "Das Becken," Bonn, 1899.

Prolapsus ovarii is a descent of the ovary by an elongation of the suspensory or infundibulopelvic ligament. The ovary moves in the arc of a circle of which the ovarian ligament is the radius, downward, inward, and backward, until it may rest at the bottom of an elongated Douglas's pouch below the level of the cervix uteri. Sanger describes two grades of ovarian prolapse: partial, to the uterosacral ligament, total, to the bottom of Douglas's pouch. The causes of the prolapse are abnormal weight of the ovary and elongation or relaxation of the suspensory ligament. The former may be due to a neoplasm, congestion, or simple hypertrophy; the latter to childbirth, flaccidity of the musculofibrous abdominal structures, increased intra-abdominal pressure, and violent exercise or traumatism In the author's experience the condition is commoner in nulliparous than in parous women, and may possibly be cured spontaneously by pregnancy. The symptoms vary in different individuals. In some the ovarian prolapse is accidentally discovered in a pelvic examination It has caused the woman no inconvenience In the majority of cases there is pelvic pain and distress, worse before and after menstruation, in coitus, defecation, and locomotion In some women the descent of the ovary occasions nausea and sickening pain, which completely incapacitates them. A peculiarity of the condition in some cases is the return of the ovary to a normal position and its retention there for a considerable length of time. If the woman is too long on her feet, strains at stool, or is violently jolted, there is a sudden return of the prolapse, with symptoms that immediately inform the woman of the fact Usually a prolapsed ovary remains permanently at its abnormally low level in the pelvis

The *diagnosis* of a simple uncomplicated prolapse of the ovary is easily made by a combined examination, either by the rectum or the vagina The ovary should be readily differentiated from a small pedunculated subperitoneal fibroid or a mass of feces by its size, shape, and consistency, and by the sickening pain occasioned by its compression between the fingers. It can be returned to almost a normal position, where it may remain or it may immediately drop back again. The diagnosis of a case complicated by pelvic inflammation or tumor is more difficult, but in such cases the malposition of the ovary is of minor importance.

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[1] Sellheim reports 44 cases ("Beitr. z. Geburtsh u. Gyn," Bd v, p 177).

If the prolapse of one or both ovaries is associated with retroflexion of the uterus, the behavior of the former after the reposition of the uterus should be carefully observed. If they return to a normal position when the uterus is replaced, no further treatment of the ovaries is required. If they remain prolapsed after the uterus is in good position, no mechanical or operative treatment of the uterine displacement will cure the displacement of the ovaries.

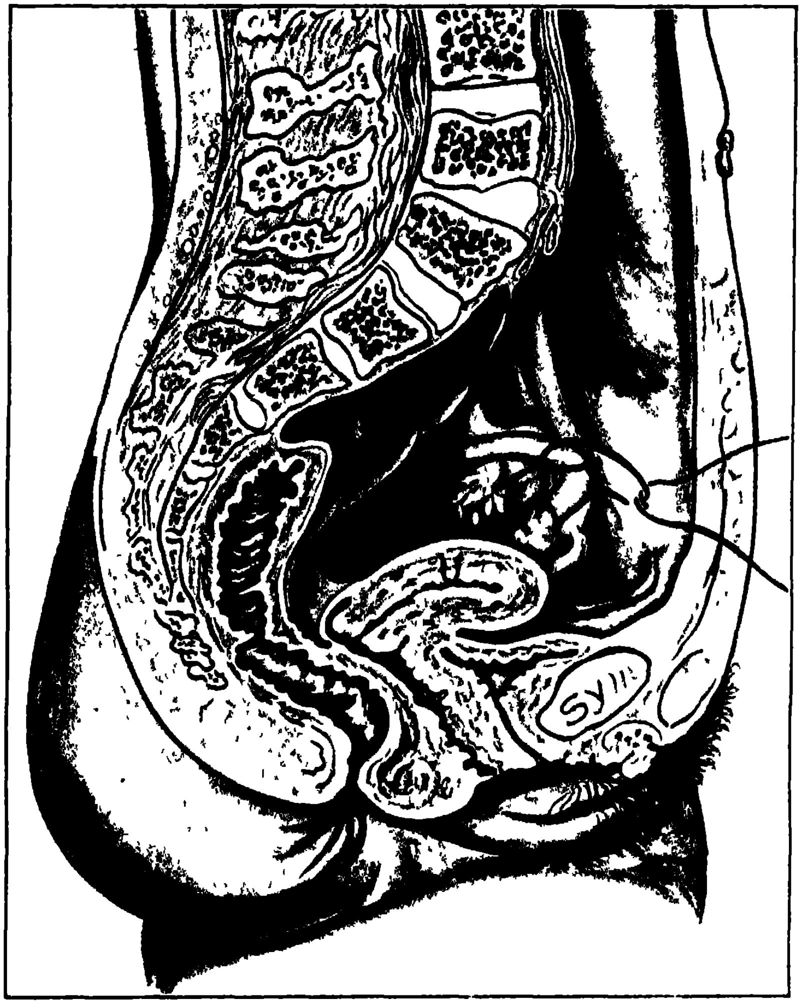

Fig. 400.—Suspending the infundibulopelvic ligament to the iliac fascia Suspensory ligament represented diagrammatically much thicker than normal.

Treatment is obviously not called for in the absence of symptoms. If the condition, as is usually the case, is a source of distress or inconvenience to the patient, the treatment may be palliative or curative. The former consists of the digital reposition of the ovary and the regular assumption of the knee-chest posture. Abdominal massage and an abdominal belt are useful adjuvants. Tampons and pessaries are of no service. They can not possibly elevate the ovary sufficiently. If palliative measures fail and the symptoms warrant it, the prolapse may be cured by an abdominal section and the suspension of the infundibulo-pelvic ligament to the parietal peritoneum over the iliopsoas muscle, above the pelvic brim, and in front of the iliac vessels.[1] The peritoneum and underlying fascia are picked up by tissue forceps; a round-pointed curved needle threaded with fine silk is inserted for about a quarter of an inch under them and two turns are taken with the same ligature around the suspensory ligament about an inch to the outer side of the ovary. As the two ends of the suture are tied, the ovary rises to a perfect position. The symptomatic results of the operation are excellent. With proper aseptic precautions it is free from danger. If it is necessary to suspend the uterus for retroversion and the ovaries remain prolapsed after the reposition of the uterus, the suspension of both ovaries not only cures the ovarian prolapse, but insures a more perfect and permanent cure of the retroflexion than could be secured by uterine suspension alone.[2]

Ovarian Hernia or Ovariocele.—The ovary may form part of the contents of the sac in inguinal hernia. It has repeatedly been observed in crural hernia, both unilateral and bilateral, more rarely in herniæ through the pelvic fascia, paravaginal ovariocele, through the sciatic and obturator foramina and through the diaphragm.

In the groin the ovary may be difficult to distinguish from lymphatic glands, myoma of the round ligament, hydrocele, or the more usual contents of the hernial sac. Its size, consistency, and sensitiveness, but most of all the premenstrual swelling and increased pain, are distinctive. The ovary in an inguinal hernia is often diseased or at least chronically congested and enlarged. It shows a tendency in this situation to malignant degeneration. It is frequently adherent. There is usually some malformation of the genitalia, as uterus unicornis or bicornis. The hernia may be congenital or acquired, more commonly the former. In the latter case the hernia is unilateral, the ovary is easily replaced, and there are a knuckle of bowel and omentum in the canal; the tube often remains in the abdominal cavity. In congenital cases the tube and the uterus, especially one horn of a malformed organ, are often found in the sac. In bilateral ovarian hernia the woman is usually sterile (Olshausen).

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[1] The credit of devising this operation belongs to Sänger ("Centralbl. f. Gyn.," 1896, No. 9), although many surgeons, including the author, had independently suspended a prolapsed ovary before the appearance of Sänger's paper.

[2] The author has attended in confinement a patient on whom he had performed this operation two years previously. The symptomatic cure is perfect; the ovaries and uterus remain in normal position.

No treatment is called for in favorable cases except the reposition of the hernia and the adjustment of a truss. If the ovary is enlarged, diseased, or adherent; if a truss is inefficient, or if there is decided discomfort, the sac should be laid open, the ovary and other contents returned within the abdomen, and a radical operation (Bassini's) for hernia performed. If the ovary is distinctly diseased or is much injured in separating adhesions, its removal is indicated. If an ovarian hernia is discovered in the course of a celiotomy, it may be pulled back into the abdominal cavity, the hernial ring being obliterated by sutures

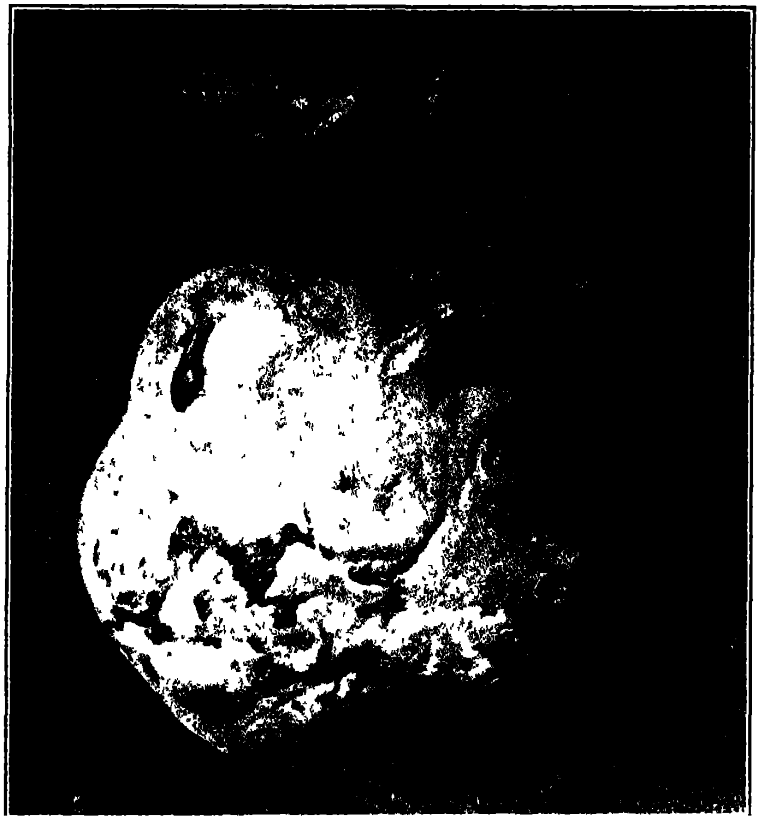

Fig 401.—Ovary converted into thin-walled retention cysts of the Graafian follicle (hydrops follicularis), into each of which there has been an intrafollicular hemorrhage

Circulatory disturbances of the ovary result, on the one hand, in congestion, hypertrophy, edema, and hemorrhage; on the other hand, in atrophy and necrosis.

Ovarian congestion has many causes. It is physiological in the few days preceding menstruation, in pregnancy, and during coitus. If it is intensified or long continued, it is likely to induce

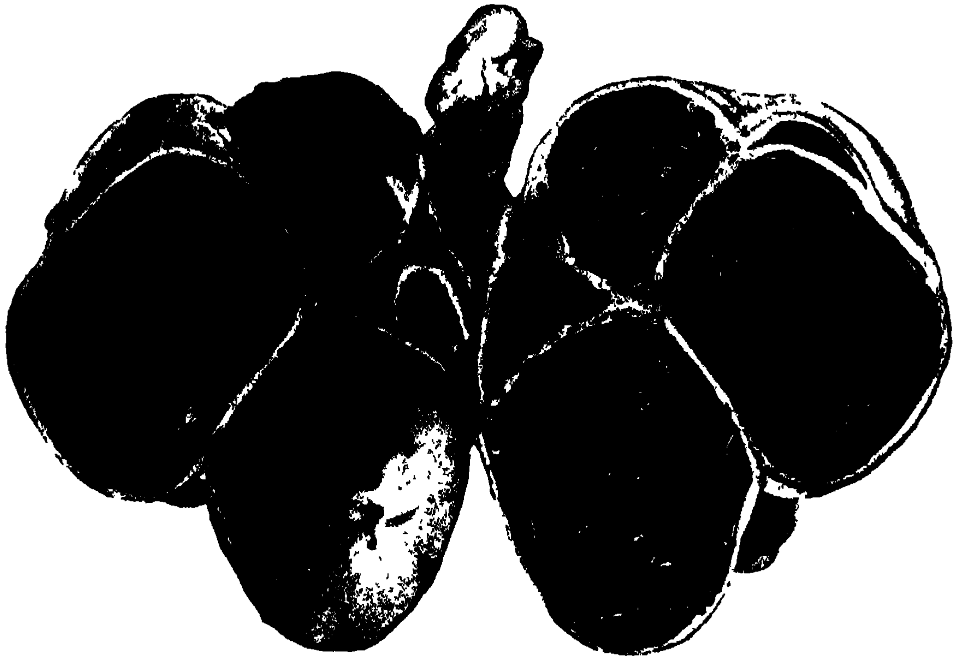

Fig 402 —Same as figure 401, the blood-clot has been turned out of the section on the left, and has been left *in situ* on the right.

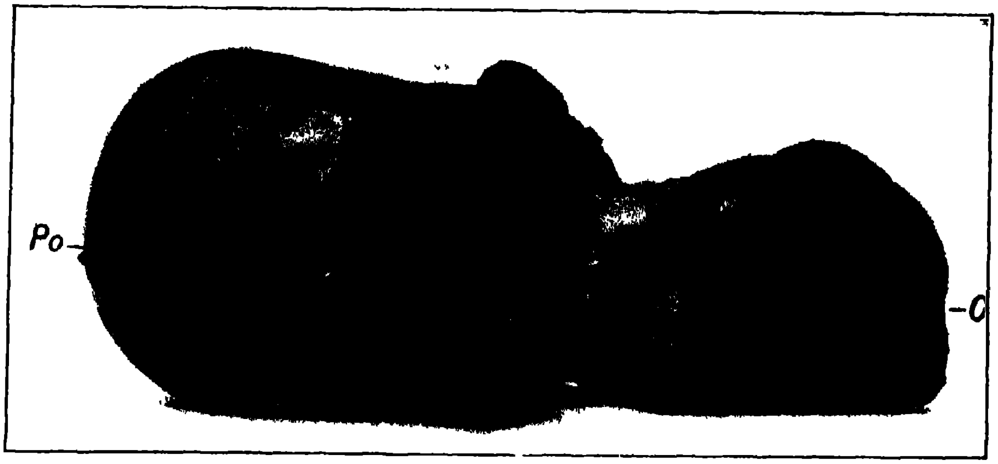

Fig 403 —Ovarian retention cyst: *O*, Retention cyst (hydrops follicularis) associated with a parovarian cyst, *Po*, parovarian cyst.

pathological changes. Venereal excesses or abnormalities, such as interrupted coitus; any of the causes of pelvic congestion in general, as physical or mental overexertion, especially at the menstrual periods; displacement of the uterus, exposure to cold during the periods, may lead to chronic parenchymatous hypertrophy, or cirrhosis, if the congestion is gradual in onset and long continued, or to edema and hemorrhages if the congestion is acute and intense.

Parenchymatous hypertrophy is observed in the so-called "cystic ovaries" in which the Graafian follicles are much enlarged and the ovary presents an irregular surface with protruding follicles of varying sizes. The ultimate stage of this condition is a true retention cyst of a follicle converting the ovary into a small cystic tumor In such a case the distention of the affected follicle is sufficient to reduce the rest of the ovary by pressure to an atrophic mass forming part of the cyst-wall. The process is necessarily self-limiting because the liquor folliculi produced by the

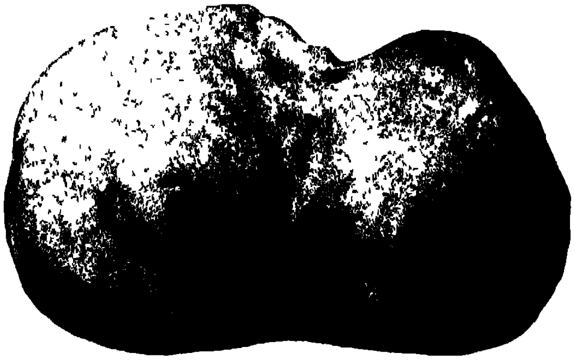

Fig 404 —Whole ovary occupied by two corpus luteum cysts

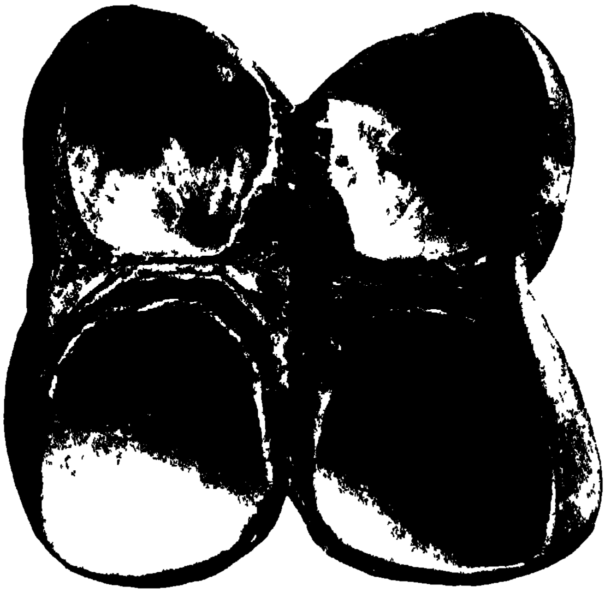

Fig 405 —Same as figure 404, laid open

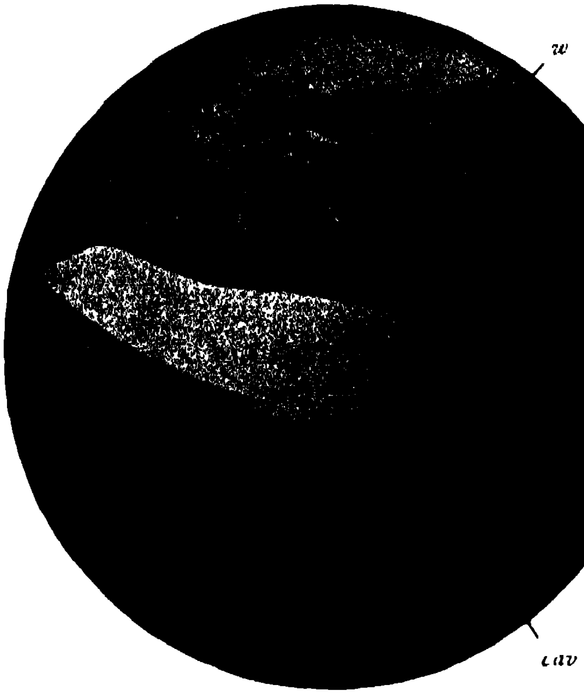

Fig. 406 —Cystic corpus luteum *cav*, Cavity of cyst, *w*, wall of cyst, showing convolutions (McConnell and J C Hirst)

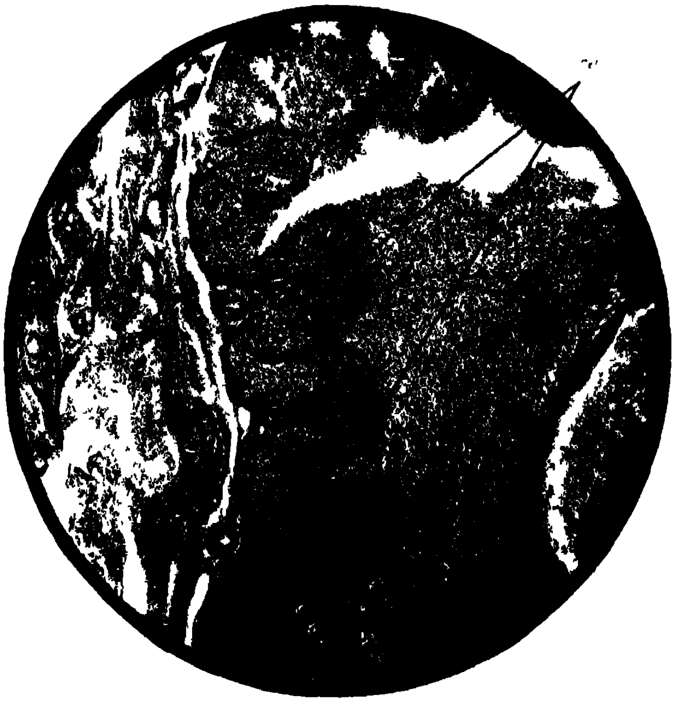

Fig 407 —Wall of corpus luteum: *w*, Wall of corpus luteum, showing fan-shaped plications (McConnell and J. C. Hirst).

epithelium of the follicles reaches only a moderate amount when the membrana granulosa itself becomes atrophic by reason of the intrafollicular pressure. Ordinarily but one follicle is affected and the cyst is unilocular. Several follicles may be the seat of retention cysts, in which case the ovary is converted into a small multilocular cystic tumor. If one of these hypertrophied follicles bursts, a very large corpus luteum is developed and there is likely to be formed a *corpus luteum cyst* in which the fluid is furnished partly by the much hypertrophied and multiplied lutein cells, partly by extravasated blood. One or two such cysts may occupy a whole ovary. A long-continued congestion of the ovary, as in any of the body organs, results in overgrowth of connective tissue, which in time shrinks into a scar-like tissue—cirrhosis In the first stage of the connective-tissue overgrowth the organ is enlarged; in the secondary stage it shrinks and becomes unnaturally firm in consistency. It is tough in feel and appearance, and its surface is marked by superficial sulci dividing it into apparent lobes. There may be no prominent follicles and no corpora lutea; corpora albicantia are numerous; the parenchyma is atrophic. The albuginea is thickened.

Acute and intense congestion may cause edema and hemorrhage. The former is only temporary, but may be excessive and may be associated with ascites

Ovarian hemorrhage displays three forms, interstitial, follicular, and diffuse. The first occurs from the capillary network around the follicles, which may be destroyed by the pressure of the extravasated blood The second occurs either as an extravasation from the theca interna under the membrana granulosa or as a hemorrhage into the follicular cavity, bursting its way through the epithelium (Fig. 402). In the third form—*hæmatoma ovarii*—the whole ovary is converted into a blood-sac The organ has the consistency and somewhat the appearance, on section, of a spleen. The ovarian structure proper disappears and the ovary is virtually destroyed. A diffuse or intrafollicular hemorrhage may result in an intra-abdominal bleeding by rupture of the ovarian capsule, possibly with a fatal result, or more likely causing an intraperitoneal hematocele.

The symptoms of ovarian congestion are associated usually with those of metritis and endometritis. There is usually ovarian pain, worse just before and after menstruation, centered usually above the middle of Poupart's ligament, and worse as a rule on the left side. "Mittelschmerz" is not infrequent and there may be extreme dysmenorrhea. In cirrhosis of the ovaries the dysmenorrhea with scanty menstruation is often most distressing As in all the diseases of the pelvic organs, but most particularly of the ovaries, there is likely to be a long train of reflex and neurotic disturbances, such as pain in the head or nape of the neck, digestive disturbances, backache, and pain in the breasts. In some patients an intense premenstrual mastalgia is the most prominent and perhaps the only symptom of ovarian congestion. On examination the enlarged and hyperesthetic ovaries may be palpated. The increased size and weight of the organs often cause some displacement, perhaps to the grade of total prolapse. The physical peculiarities of cirrhotic ovaries in favorable cases can be plainly distinguished in a bimanual examination. In parenchymatous hypertrophy it is a not infrequent experience to feel an enlarged follicle or small retention cyst burst during the examination The physical signs of ovarian congestion or chronic inflammation may be entirely absent. An exploratory abdominal section is justifiable and necessary if persistent ovarian symptoms severe enough to seriously impair the individual's health can not be explained by the physical examination

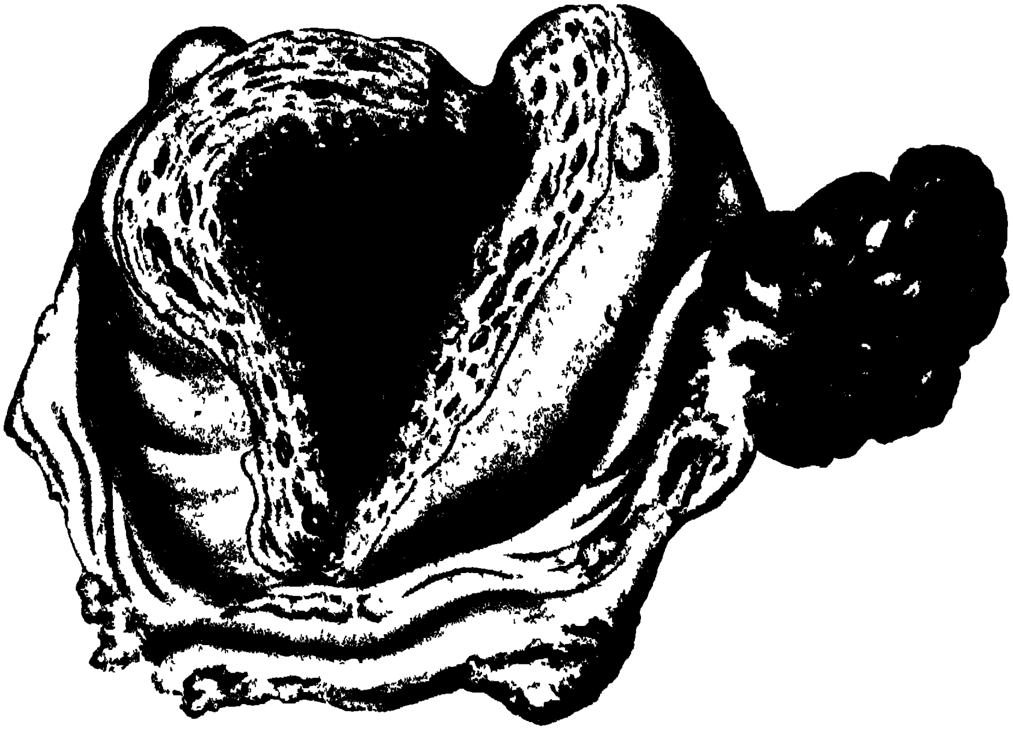

Fig 408 — Hematoma ovarii from thrombosis and complete occlusion of the spermatic vein.

The treatment of ovarian congestion is usually successful without operative interference unless the ovarian structure has already undergone radical alteration.

It is most important to discover and to eliminate the cause.

Violation of the laws of sexual hygiene or masturbation must be investigated. Displacements of the uterus, overexertion, mental or physical, and imprudence at the menstrual periods, a sedentary life, and obstinate constipation must be corrected. Heart and liver diseases or any other mechanical interference with the pelvic circulation should be looked for.

In addition to removing the cause, if possible, glycerin tampons, hot-water douches (a gallon at 120° F.), laxatives, and the regular assumption of the knee-chest posture twice a day often give great relief and may dissipate the symptoms in a few days If the ovaries have been structurally altered by retention cysts, cirrhosis, or hemorrhage, no treatment short of surgical intervention can be of any service. The patient and physician must choose between a continuance of the symptoms and an abdominal section. Even if such changes can not be demonstrated by physical signs, the inference that they have occurred is justified if typical symptoms persist unabated in spite of careful treatment. The severity of the symptoms naturally determines the course to be pursued. If the operative treatment is selected, there should be an understanding with the patient that no ovarian tissue shall be unnecessarily removed, but permission should be obtained for the radical removal of both organs if such a course is necessary for the restoration of the patient's health. On opening the abdomen[1] it is possible to determine what is really required. Puncture of hypertrophied follicles may be all that is necessary. Exsection of a wedge-shaped piece of structurally altered ovary, uniting the wound with interrupted catgut sutures, and leaving the remainder of the organ may be indicated If the ovaries are prolapsed, they should be suspended. If the whole ovary is occupied by a retention cyst, if it is in the last stages of cirrhosis or the seat of diffuse hemorrhage, it must be removed. The appendix should invariably be examined and removed if diseased. Many a case of supposed ovarian congestion or inflammation in women is really one of chronic appendicitis, often complicated by right-sided ovarian irritation, congestion, or inflammation. Even if the appendix is not diseased a fecal concretion is often felt in it which can be stripped back into the large bowel, thus removing a likely cause of inflammation in the future

Atrophy of the ovary before the menopause may be a consequence of pressure from pelvic tumors, varicocele of the broad ligament, ovarian hemorrhage, infection, systemic diseases such as typhoid fever, diabetes, anemia, chronic nephritis, phthisis, myxedema, akromegaly, the neuroses, and obesity. It may accompany superinvolution or atrophy of the uterus. The subjective symptoms are amenorrhea, absence of menstrual molimina, and sterility. A bimanual examination reveals the small size of the ovary, associated usually with an atrophied uterus.

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[1] Vaginal section for this purpose is properly losing its vogue It is impossible to palpate and inspect the pelvic and abdominal organs, including the appendix, as thoroughly by this means, and there are certain necessary steps in the treatment, such as suspension of the ovaries, which are impossible by the vaginal route.

Necrosis of the ovary is the result of a complete deprivation of blood-supply as a consequence of thrombosis or obstruction of the vessels from compression, infection, or most often from a twisted pedicle. The outer third of the tube and the ovary may be absorbed and completely disappear or be represented by a small mass of degenerated tissue (Fig. 388)

Inflammations of the Ovary.—Acute oophoritis is the result of microbic infection.[1] It is most commonly seen in puerperal streptococcic infection. Gonorrheal infection is next in frequency, as a cause of acute ovarian inflammation Other micro-organisms discovered in inflamed, suppurating ovaries are the colon bacillus, the pneumococcus, the tubercle bacillus, and the typhoid bacillus. Pfannenstiel quotes three cases of posttyphoid ovarian abscess,[2] in one of which diplococci were also found Morris Lewis and Le Conte[3] report two interesting cases in the Pennsylvania Hospital and have collected seven others. It is not yet demonstrated that typhoid bacilli are pyogenic, so that there may be a mixed infection in these cases The usual point of entrance in the ovary for infecting bacteria is through the blood-vessels and lymphatics of the hilus. Gonorrheal infection, however, most commonly occurs in a recently ruptured Graafian follicle by way of the tubal ostium Tuberculous infection also may occur from the tube or the peritoneum, but it is most commonly found in the ovarian stroma. *Primary tuberculosis of the ovary* is exceedingly rare, if indeed it has ever been clearly demonstrated. The pathological processes common to all forms of acute infectious oophoritis are hyperemia, edema, leukocyte infiltration, especially along the blood-vessels, and suppuration in the form of one localized abscess, multiple abscesses, or of diffuse suppuration. The result of ovarian suppuration is often fatal, especially in the streptococcic puerperal variety Gonorrheal ovarian abscesses are scarcely, if at all, more dangerous to life than the gonorrheal pus-tube with which they are associated. A curious result noted after the operative treatment of posttyphoid ovarian abscesses is a recurrence of the typhoid symptoms. All forms of acute ovarian inflammation and suppuration may exhibit a spontaneous cure by destruction of the ovarian substance and shrinkage of the organ or by encapsulation of inspissated or caseous pus.

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[1] It has been asserted that phosphorus- and arsenic-poisoning cause acute oöphoritis; also that an abortifacient employed in India does the same These forms of acute ovarian inflammation, if they occur, have little interest for the gynecologist.

[2] Veit's "Handbuch," vol iii, p. 272

[3] "Infection of Ovarian Cysts during Typhoid Fever." "Amer. Jour. Med. Sci.," Oct., 1902

The symptoms are those of acute infectious pelvic peritonitis and tubo-ovarian inflammation. It is often impossible to determine before opening the abdomen how much the ovary is involved in the process. There are fever, accelerated pulse, tympany, and by combined examination there is found a pelvic exudate, a large fixed mass to either side of or behind the uterus, in which it is not usually practicable to differentiate the ovary from the occluded, distended tube. Occasionally the swollen ovary may be mapped out. The agonizing pain of acute oöphoritis is a valuable diagnostic symptom. There is nothing in the pelvis so exquisitely sensitive as an inflamed ovary, except a tubal gestation sac. Much greater pain and sensitiveness than are usual in pelvic inflammations point, therefore, to the likelihood of ovarian inflammation and suppuration The treatment of acute suppurative oöphoritis is the removal of the infected ovary by an abdominal section. In all forms of infection except the streptococcic the operation promises a good result and often saves the patient from imminent danger. In streptococcic puerperal infection the operation is equally demanded, but there is the grave disadvantage that the infected pelvic connective tissue of the mesosalpinx is exposed in the stump after the removal of the ovary and the streptococci let loose in the peritoneal cavity may rapidly develop a fatal peritonitis. One means of escaping this danger, in the author's experience, is to avoid mass ligatures and to thoroughly drain the pelvis by a glass tube and gauze packing which completely fills the pelvic cavity.[1] (See page 633) Another is to use Downes' cautery clamp on the stump (p 589).

If acute oöphoritis does not reach the suppurative stage it may subside completely after rest in bed, the ice-water coil over the hypogastrium, laxatives, and hot vaginal douches No further treatment is required. If the acute inflammation subsides and leaves a disorganized ovary embedded in dense peritoneal adhesions, radical operative treatment may be demanded

Tuberculosis of the ovaries is exceedingly rare. A case of primary infection is reported by Jacobs.[2] The other recorded cases were secondary to tuberculous inflammation of the tubes, peritoneum, and intestines. The stroma is mainly involved, but cheesy masses may be found in corpora lutea or ruptured Graafian follicles.

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[1] In one of my cases the patient was operated on in a comatose condition, with a pulse of 140 and a temperature of 104°. In twenty-four hours the patient's mind was clear and the fever had subsided. In that time more than a pint of serous pus swarming with streptococci had drained from the pelvic connective tissue.

[2] "Centralbl. f Gyn.," 1893, p. 75.

Actinomycosis of the ovaries has been observed in connection with infection of the genitalia, peritoneum, and liver. The ovary is described as "worm-eaten," with numerous small foci of suppuration in which colonies of actinomyces were found.[1]

Chronic Oophoritis.—Much that has been said of chronic congestion applies to chronic inflammation of the ovaries. The later stage of long-continued congestion is inflammation with involvement, more particularly, of the stroma. The disease is usually bilateral. The causes of chronic inflammation are any of the causes of long-continued congestion, a previous acute oöphoritis, inflammation of neighboring organs, particularly of the tubes and of the pelvic peritoneum. Oöphoritis is often associated with fibroma and carcinoma of the uterus. The structures involved in the inflammation are the stroma predominantly, but often the parenchyma also There is an overgrowth of connective tissue and a follicular hypertrophy. The stroma is thickened, the blood-vessels in it are enlarged and may be obliterated by endarteritis obliterans. There is a tendency to formation of Graafian follicle retention cysts (the so-called cystic ovaries) There are few, if any, corpora lutea, but numerous corpora fibrosa, which are formed by the degeneration of the follicular epithelium, the absorption of the liquor folliculi, and an invasion of the follicular space by connective tissue without the formation of a lutein-cell membrane. The whole ovary is enlarged, of firm consistency, except in the region of the retention cysts, and heavy. The superficial epithelium is unaltered, but the ovary is frequently embedded in peritoneal adhesions which may completely envelop

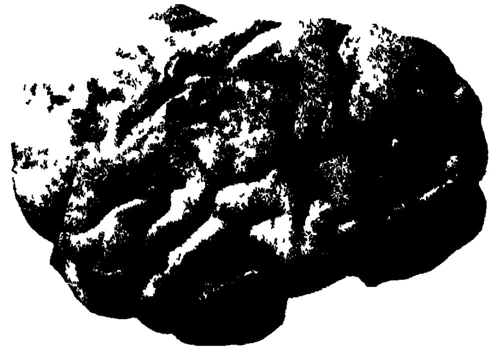
Fig 409 —Cirrhosis of ovary

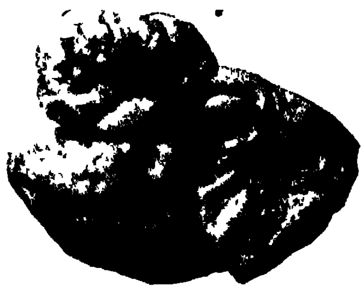
Fig 410 —Cirrhosis of ovary

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[1] Stewart and Muir, "Edinburgh Hospital Reports," vol. i.

it. This fact in connection with the thickened albuginea, and the degeneration of the follicles (corpora fibrosa) explain the sterility that is a frequent consequence of chronic oophoritis.

The **symptoms** are ovarian pain, aggravated at the menstrual period, especially before and after the flow; pain on defecation, coitus, or a sudden jolt or jar from any cause, possibly an intermenstrual pain ("Mittelschmerz"), long-continued and profuse menstruation, and in the ultimate stages of the disease scanty menstruation and amenorrhea with possibly a premature menopause. There is no disease of the pelvic organs so often associated with reflex and neurotic symptoms of the most varied kind.

The **diagnosis** of chronic oöphoritis is made by the subjective symptoms and the physical signs. The latter are determined by a bimanual or combined examination, in which the increased size, the density, and the unnatural sensitiveness of the ovary are apparent. If there are peritonitic adhesions (peri-oophoritis) the fixed position or limited mobility of the ovary is demonstrable. In such a case there is usually also some degree of prolapsus ovarii which makes it more accessible to the combined examination

In the ultimate stages of chronic oophoritis with shrinkage of the ovary (ovarian cirrhosis) the diagnosis may be more difficult, but in a case favorable for examination, the dense consistency, small size, and irregular surface may be clearly appreciated

The **treatment** should aim at obviating the causes of chronic congestion, if possible. If there is much structural alteration of the ovary, the oophoritis itself is incurable It is always an anxious question in the individual case to decide upon the necessity for oophorectomy. The gravity of the symptoms, the age and social state, the incapacity of the patient, especially if she is of the working classes, must decide patient and operator in the individual case.

After the abdomen is opened it may be found practicable to obtain a symptomatic cure by releasing adhesions, puncturing retention cysts, excising wedge-shaped pieces of the most diseased portions of the ovaries, and possibly suspending them, at the same time inspecting all the neighboring pelvic and abdominal structures and removing any source of continued irritation or congestion, as a diseased tube, varicocele of the broad ligament, or an inflamed appendix. If the patient is a young woman with prospects of matrimony and maternity, every effort should be made to conserve ovarian tissue, at the risk of a persistence of some of the symptoms or of a second operation. If, on the contrary, she has borne several children, if she is likely to remain single, if invalidism in her case means pauperism, if she is the support of dependent relatives, the main object must be a radical removal of all source of future pain and incapacity even if a premature menopause and sterility are the consequence.

NEOPLASMS OF THE OVARY.

Among the numerous classifications of ovarian tumors, that of Pfannenstiel is the most convenient and scientific.

Ovarian tumors are either parenchymatogenous or stromatogenous. The parenchymatogenous tumors may be derived from the epithelium of the ovary or from the ovule (ovulogenous). The parenchymatogenous tumors are simple serous cysts, serous and pseudomucin cystadenomata, carcinomata, dermoids, and teratomata, the last two being ovulogenous.

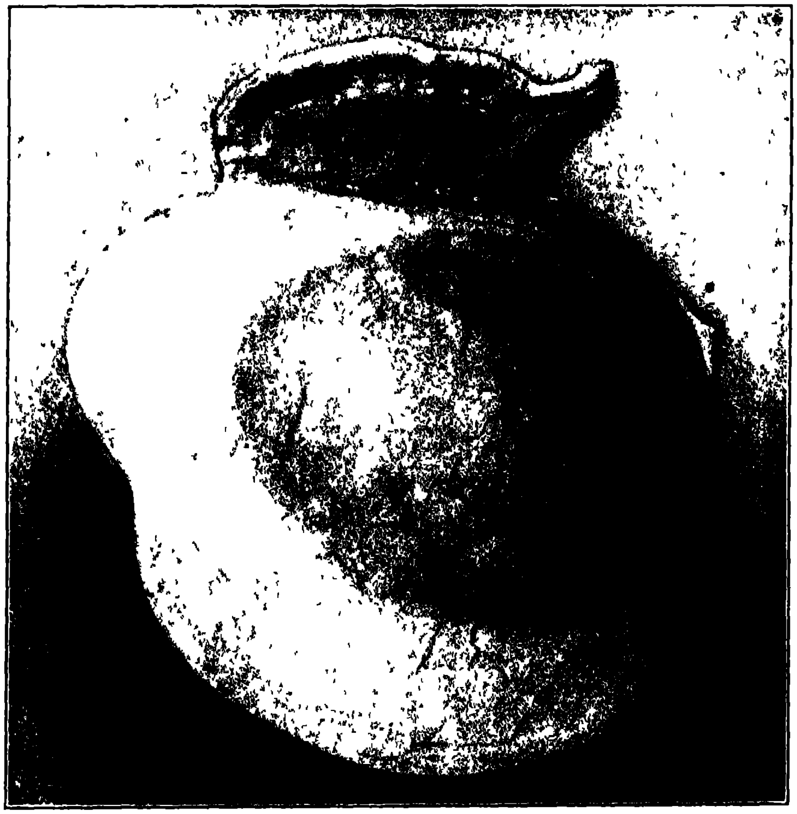

Fig 411 —Simple serous cyst of ovary

The stromatogenous tumors are fibromata and fibromyomata, sarcomata, endotheliomata, angiomata, enchondromata, and myomata.

There may be a combination of several of the above-named tumors in one ovary All of the cystic growths may develop a papillary hyperplasia of the epithelium. Any of the ovarian tumors may grow between the layers of the broad ligament and may consequently be intraligamentary. Serous cystadermomata have the greatest tendency to this form of growth; pseudomucin cysts, the least Dermoid cysts are also very rarely intraligamentary. Obviously a gross division of ovarian tumors may be made into the cystic and the solid.

Simple serous cysts of the ovary differ from a retention cyst of a Graafian follicle (hydrops follicularis) in possessing an epithelial lining unlike that of the follicle, and displaying active proliferation. They are differentiated from the cystadenomata by the absence of proliferating gland tubules in the cyst-wall and by the different character and behavior of the epithelium They are lined by a single layer of columnar epithelial cells which occasionally take on a syncytium-like form

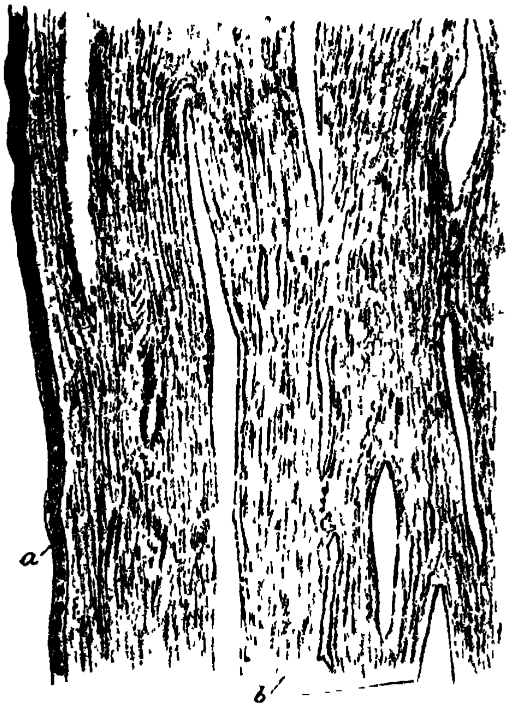

Fig 412.—Wall of simple serous cyst: *a*, Epithelium; *b*, cyst-wall with numerous blood-vessels (Pfannenstiel)

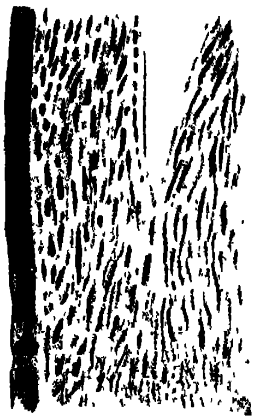

Fig. 413 —Syncytium like epithelium of simple serous cyst (Pfannenstiel)

The cyst is usually unilocular and at most has but two or three loculi. It is almost always pedunculated, but may be intraligamentary. The cyst-wall, composed of connective tissue, is thin. The tumor is ordinarily moderate in size, but may reach huge dimensions The fluid is a serum rich in albumin, but without a trace of pseudomucin, it does not coagulate on exposure to the atmosphere. Quite frequently there is a papillary outgrowth of the epithelium in the interior of the cyst.

The origin of the tumor is most likely a pathological transformation of the follicular epithelium and there is usually a history of previous ovarian inflammation.

Simple serous cysts of the ovary are absolutely benign. Their contents may be discharged into the abdominal cavity without harm. There is never a recurrence nor an implantation metastasis after their removal

In their clinical features they are very like parovarian cysts, for which they are often mistaken.

The growth is usually unilateral. The pedicle of the tumor, as of all pedunculated ovarian cysts, is composed of the tube, the mesovarium, the ovarian ligament, and the infundibulopelvic ligament.

The mode of growth is also like that of all pedunculated ovarian cysts At first the tumor moves inward and downward into Douglas's pouch, and then, as its size increases, upward and outward, making a twist in the pedicle of 90 degrees, the turn being always toward the side from which the tumor sprang. The uterus is commonly pushed backward as the tumor ascends into the abdomen. The intestines are displaced upward and backward, the small intestines being mainly behind the tumor, the large bowel surrounding it above and in the flanks, giving rise to the so-called corona of resonance around an ovarian cyst on abdominal percussion. The rate of growth in simple serous cysts is slow. After reaching moderate dimensions there may be a complete cessation of further growth, most likely from atrophic and degenerative changes in the lining epithelium due to intracystic pressure. If tapped or ruptured the cyst usually refills. Cases are recorded, however, of cure after rupture.[1]

Ascites may accompany any of the ovarian tumors. If the serous exudate into the peritoneal cavity is excessive and is associated with pleural effusion, as it almost always is if the ascites is marked and long continued, the ovarian tumor is probably malignant or else there may have been a rupture of a proliferating cyst and an extension of the epithelial growth to the peritoneum. Ascites, however, is not always a sign of malignancy or rupture; it is associated with a fibroma of the ovary and may even be observed with simple serous cysts, though it is least commonly associated with such ovarian tumors.

Pseudomucin Cystadenomata.—The ovarian cystadenomata are characterized by the formation of gland tubules, rapidly proliferating, lined with a secreting epithelium in a single layer of cells, becoming rapidly distended by secretion into cysts with thin partition walls that frequently rupture, so that many small cysts

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[1] The author has seen a pedunculated, thin-walled ovarian cyst rupture as the patient, alighting from a street car to enter the hospital for operation, fell upon her abdomen The tumor disappeared and did not return

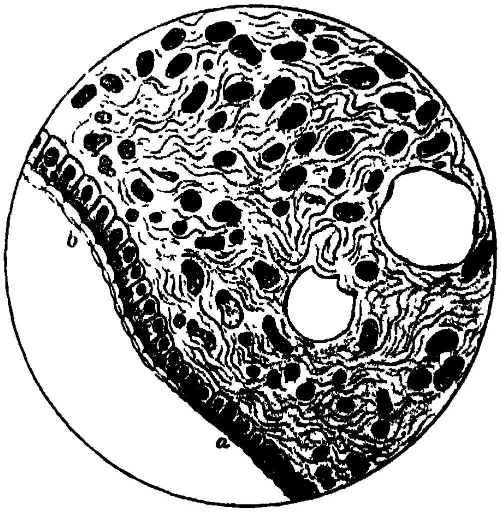

Fig 414

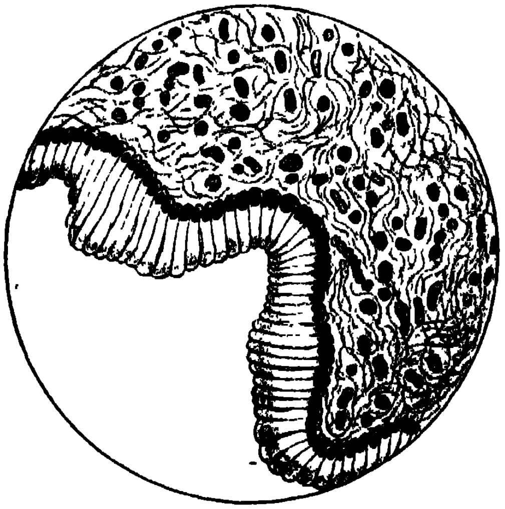

Fig 415.

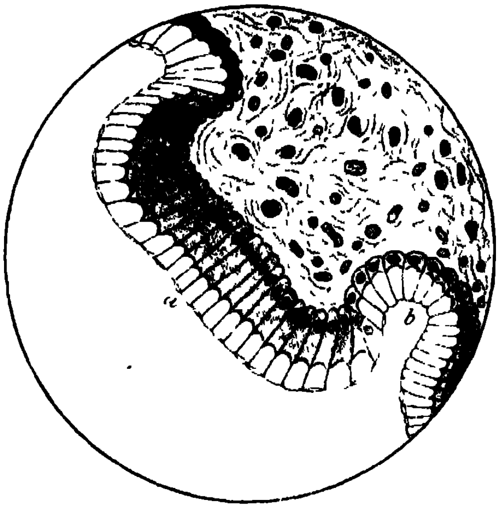

Fig 416.

Figs 414, 415, 416.—The stages of pseudomucin formation and excretion. In figure 414, at *a* the cells are inactive, the contents are mainly albuminous. In figure 415 the epithelium is longer, the albuminous material is collecting around the nuclei at the bases of the cells, pseudomucin is formed, but not so sharply differentiated from the albumin. In figure 416 the pseudomucin is perfectly transparent and sharply differentiated from the albuminous cell contents. The pseudomucin is discharged from the interior of the cell, which is not destroyed or desquamated, but begins again to accumulate the pseudomucin. The greatest quantity of this material is seen in the cells at *b* in figure 416; there is least at *b* in figure 414 (Pfannenstiel).

coalesce into larger cyst cavities. In the thicker walls of these cavities the proliferation of gland tubules progresses rapidly to form new daughter cysts. The gland tubules in ovarian adenomata are not like the Pflüger tubes or egg cords in the formative stage of ovarian development. They closely resemble the tubular utricular glands.

Ovarian cystadenomata are divided into pseudomucin cystadenomata and serous cystadenomata, according to their contents and the character of their epithelium.

Pseudomucin cystadenomata are probably derived from the follicular epithelium. They are the commonest kind of ovarian cyst.

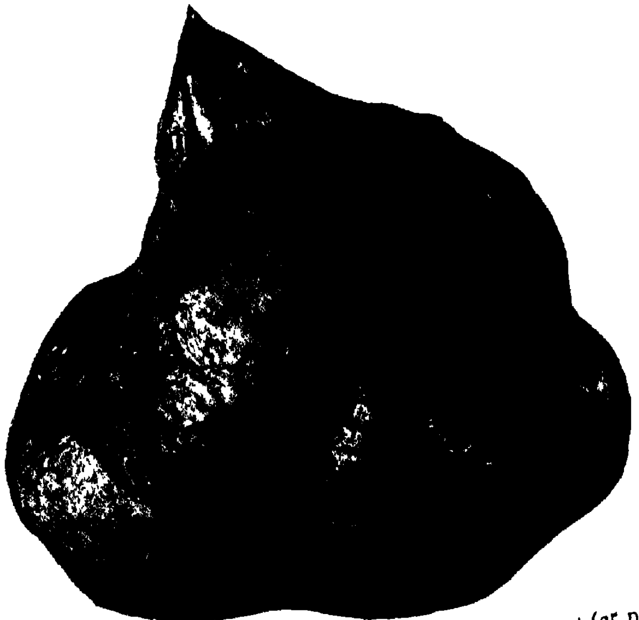

Fig. 417 —External appearance of large multilocular ovarian cyst (35 pounds)

The original gland tubules in which the growth begins soon disappear on account of the rapid accumulation of secretion which quickly distends the tubules into coalescing cavities. The tubules and cyst cavities are lined with a single layer of high columnar epithelium, with the nucleus at the base, secreting their characteristic material as the cells of the stomach and gall-bladder secrete their mucus.

The pseudomucin [1] (Hammarsten) contained in these cysts is a peculiar substance most closely resembling mucus, but not responding to its acetic acid reaction. It has no chemical resemblance to albumin and responds to none of the agents which coagulate albumin After boiling with the mineral acids a sort of glucose is formed which gives the sugar test with Fehling's fluid. It has the consistency of a jellyfish and may be cut with scissors. It is perfectly colorless and transparent.

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[1] Formerly called "metalbumen"

Typically pure pseudomucin is found in the smaller new-formed cyst cavities of a cystadenoma. In the larger cavities there is a serous effusion, often some blood extravasation and cell detritus which gives the fluid an albuminous character and alters its color to white, red, black, brown, or green, and changes its consistency to that of honey or water. The larger the cyst cavity, the less resemblance its contents have to pseudomucin

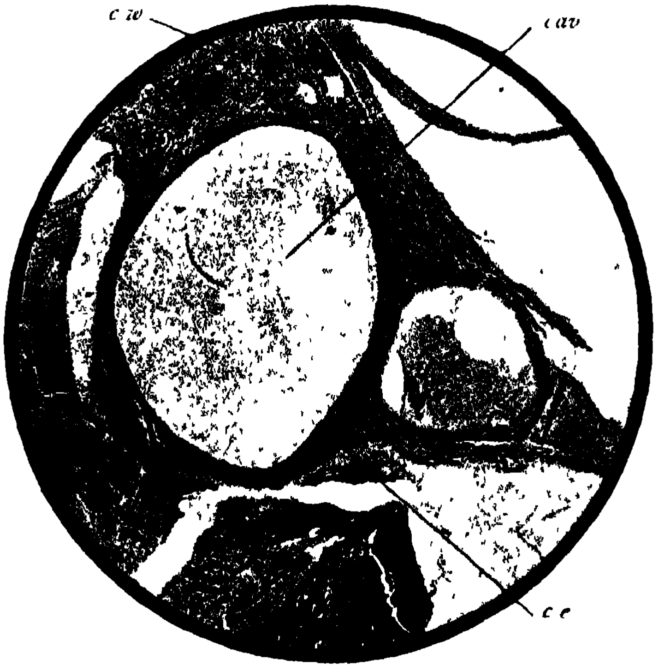

Fig 418.—Wall of glandular cyst of ovary: *cav*, Cavity of cyst; *c e*, columnar epithelium; *c w*, fibrous cyst-wall (McConnell and J C Hirst)

A pseudomucin cyst is always multilocular, but one cyst cavity usually predominates in size. The predominance may be so great that the cyst appears to be unilocular until it is carefully studied. On the other hand, there may be no great difference in the size of the cyst spaces The septa between the cavities are derived from the main enveloping connective-tissue tumor-wall. They carry into the interior of the tumor the blood-vessels which enter at the hilus and running in the main cyst-wall send branches along its continuation in the partitions between the cyst spaces. The tumor is usually unilateral and pedunculate, but it may be bilateral and intraligamentary. The rate of growth varies, but is comparatively slow. In eight or nine months

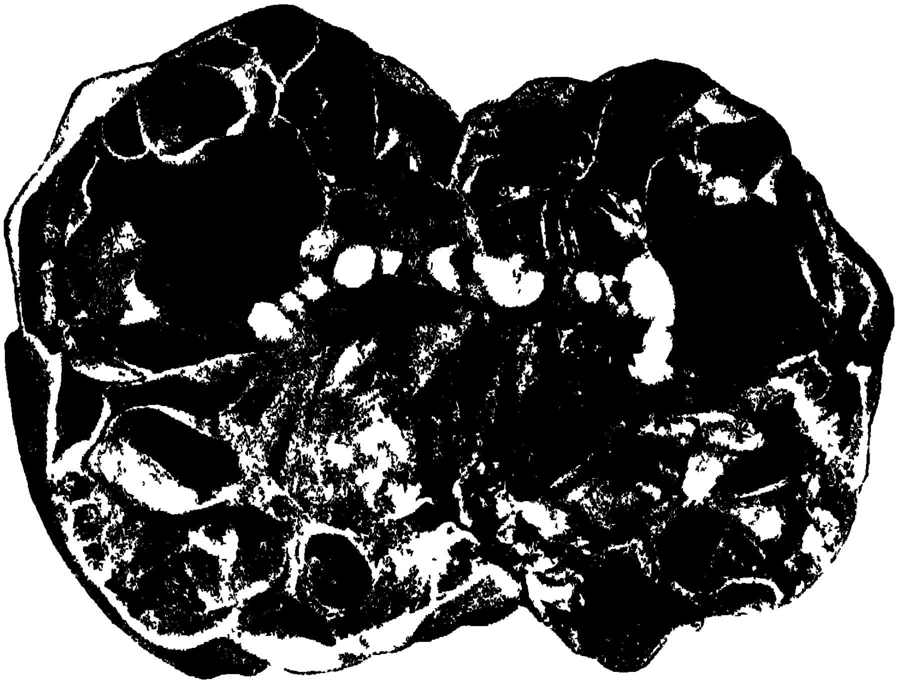

Fig 419 —Section of pseudomucin cyst, hardened in formalin solution

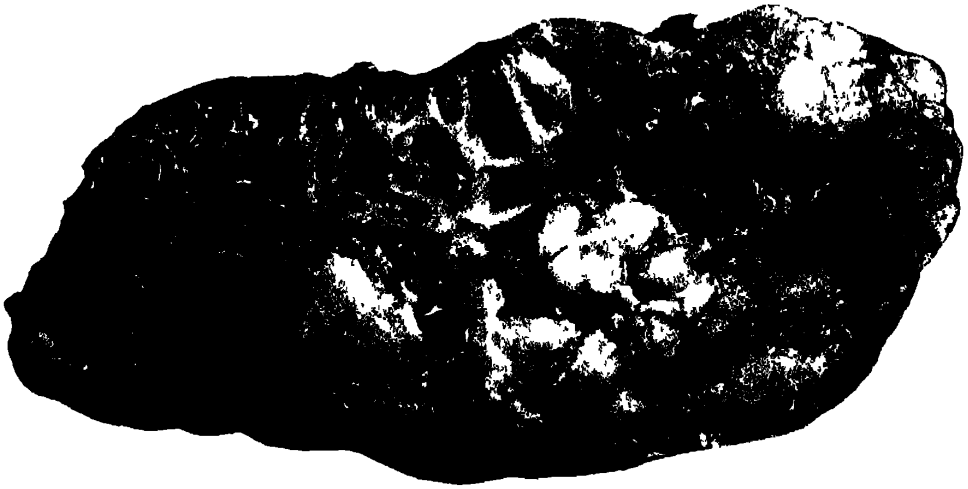

Fig 420 —Section of pseudomucin cyst, hardened in formalin solution There are numerous loculi of about equal size.

after the first subjective symptoms the tumor is commonly as large as pregnancy at term. In the older literature cases are recorded in which ovarian cysts were carried for many years and reached an enormous size. In one of the author's patients who positively refused operation it took eighteen months for the tumor to grow from the size of an infant's head to a size that taxed the capacity of the abdominal cavity to the utmost, and to a weight of more than 90 pounds. Pseudomucin cysts are benign and give rise to no recurrence in the ordinary pathological sense, but implantation metastases are possible in the visceral and parietal peritoneum and in the abdominal wound after operations for their removal These metastases may take the form of small proliferating cysts, very slow in growth and possibly of no great clinical significance On the contrary, the proliferation of the epithelium and the production of pseudomucin may go on actively and unchecked until enormous tumors develop which can not be completely removed and end in the patient's destruction. In the peritoneal cavity this form of metastasis is known as *pseudomyxoma peritonei.* Fragments of cyst epithelium may escape through a spontaneous rupture of the cyst-wall or during an operation, and may be implanted in the peritoneum, in which the same sort of growth continues that is observed in the parent cyst. Masses of pseudomucin weighing 40 pounds have been removed

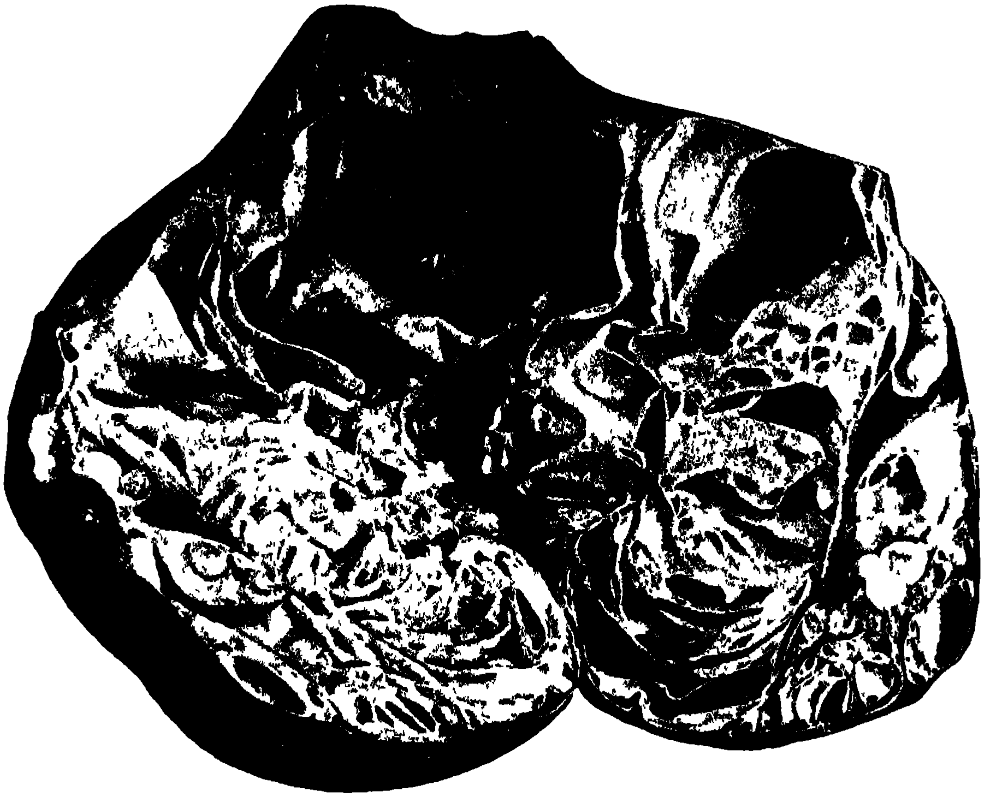

Fig 421 —Section of pseudomucin cyst, hardened in formalin solution one chief cyst cavity, occupying about half the bulk of the tumor

from the peritoneal cavity (Olshausen). The operation is rarely complete and a continuance of the pseudomucin formation is observed, requiring perhaps repeated operations. Abdominal and fecal fistulæ form and not infrequently the patient dies of exhaustion or infection.

Papillomatous growths in pseudomucin cysts may also give rise to implantation metastases. Their complete removal may be impossible and the ultimate result may be fatal from pressure upon and ulceration of the pelvic and abdominal viscera or from cancerous degeneration of the papilloma.

Serous cystadenomata of the ovary are characterized by multilocular cysts lined with a columnar ciliated epithelium and containing a yellowish or greenish albuminous fluid without colloid material and without a trace of pseudomucin. There is reason to believe that they are derived from the superficial or germinal epithelium of the ovary. In the cyst-walls there are the same proliferating gland tubules seen in pseudomucin cysts. The majority of serous cystadenomata are papillary. They do not as a rule reach a very large size. There are not so many loculi as in pseudomucin cysts and many of the tumors appear macroscopically to be unilocular, the septa between the large cyst spaces having ruptured or undergone necrosis. The non-papillary cysts are usually pedunculated. The papillomatous cysts are commonly intraligamentary and subserous.

The non-papillary cysts are very slow of growth, are usually unilateral, occasion little disturbance, are not a cause of ascites, and, having a good pedicle, are easily removed. They do not recur and scarcely ever give rise to implantation metastases. The papillary serous cystadenomata are also slow in growth, but, being intraligamentary, as a rule cause serious pressure symptoms, and the luxuriant growth of papillomata both in the interior and on the surface of the tumor often gives rise to peritoneal implantation metastases (13.3 per cent—Pfannenstiel). It may be impossible to remove all the papillary masses or a small portion of the papillary growth may be inadvertently set free in the peritoneal cavity during an operation. Recurrence of the growth in such cases is likely, with involvement of vital organs. Ascites, often to an enormous extent, is the invariable rule in superficial papillomata; it is usually associated with pleural effusion. These growths are often bilateral. Even if one ovary appears healthy at the time of operation, the development in it of a papillary serous cystadenoma is likely in the future. Both ovaries, therefore, should be removed even if only one is affected. Every particle of the papillomatous growth should also be removed wherever situated, else a recurrence may be expected.

Papillomatous Growths in Ovarian Cysts.—As already stated, papillomata may develop in any ovarian cystic neoplasm, in simple serous cysts, pseudomucin cysts, and serous cystadenomata. They are most frequently seen in the last named. The growth is a proliferation of epithelium analogous to the proliferating gland tubules of the cystadenoma, but growing outward instead of inward. The histology is that of benign columnar cell papilloma everywhere. There is a branched extension of epithelium in a single layer, with a basis of connective tissue which in the older parts of the growth constitutes a stem of considerable thickness. The whole mass may be cauliflower in form, with a pedicle, but the latter may be very short or altogether wanting. The growth may be elevated to the size of an apple or larger, or may be small excrescences giving the surface from which they grow the rough appearance of a file. The growth is very vascular. It is prone to degenerative changes, fatty degeneration, necrosis, and calcification. Myxomatous degeneration of the end-branches of the papillæ is occasionally observed, distending them into knob-like processes like the chorion villi in cystic degeneration, and giving to the tumor the grape-like form of a hydatidiform mole. While papillary growths are usually found in the interior of the ovarian cysts, they are not infrequently developed on the surface, especially in serous cystadenomata.

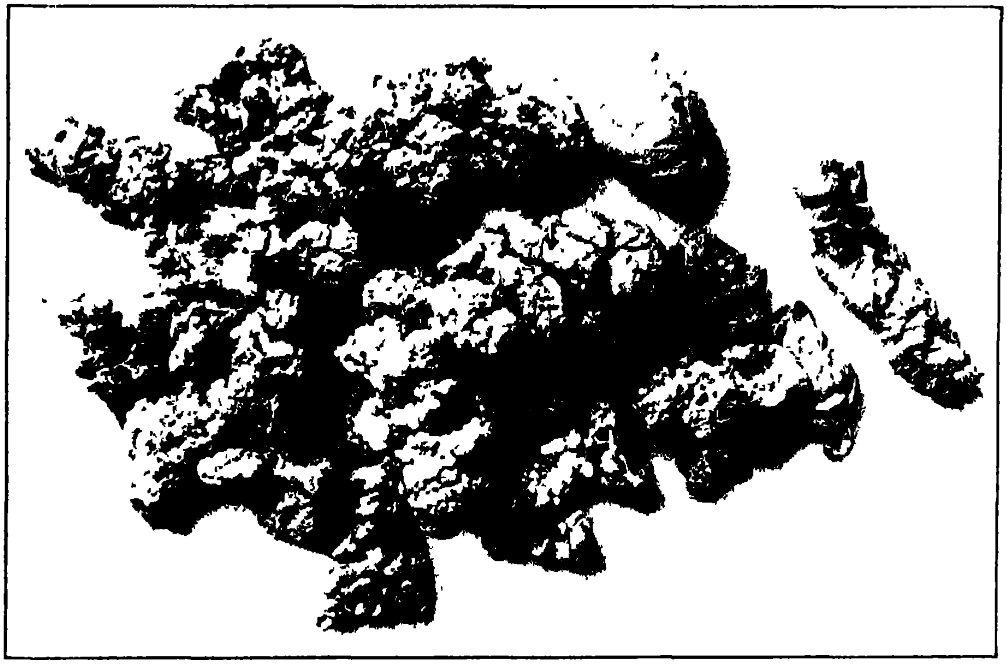

Fig. 422.—Papilloma removed from posterior surfaces of broad ligaments and uterus.

Ascites always follows and the growth usually spreads over the pelvic peritoneum or is implanted anywhere on peritoneal surfaces. The explanation of surface papillomata is usually a growth of the surface germinal epithelium of the ovary and not a rupture or perforation of the cyst-wall, setting free the papilloma of the interior, though such an occurrence is possible. Rarely the papillomata may undergo cancerous degeneration. Without any such malignant change they themselves are on the border-line between benign and malignant growths. While they do not actually invade the tissues and structures to the peritoneal covering of which they are attached, their tendency to spread, to implantation metastases, and to recurrence gives them a semi-malignant character. They complicate, often gravely, the operative treatment of ovarian cysts. The removal of an intraligamentary papillomatous serous cystadenoma is usually a formidable task and its complete removal may prove impracticable. It may also be difficult or impossible to remove the papillomatous masses from peritoneal surfaces in superficial growths. A papillomatous growth in an ovarian cyst must therefore be regarded as an unfavorable complication.

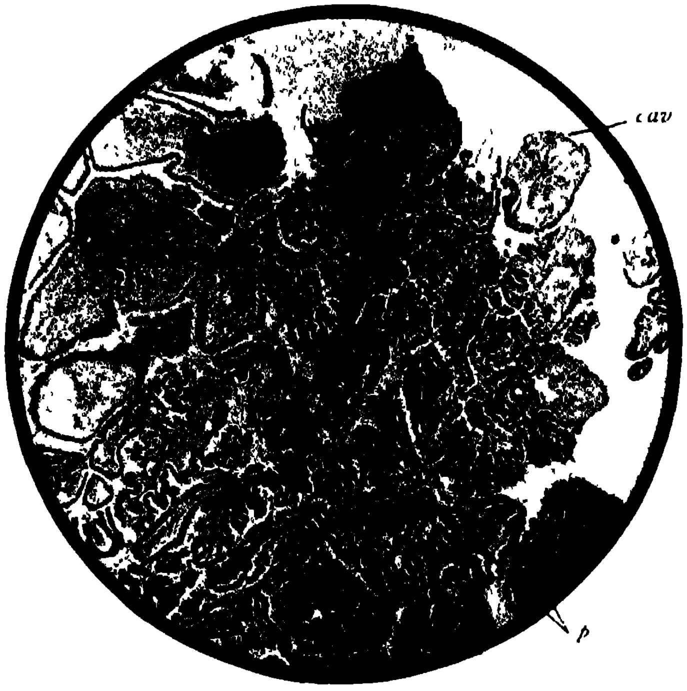

Fig 423 —Part of wall of papillary ovarian cyst: *cav*, Cyst cavity, *p*, papi (McConnell and J C. Hirst)

If, however, the complete eradication of the papilloma is practicable, as is usually the case, the result of operative treatment is satisfactory. The ascites and pleural effusion permanently disappear and there is no recurrence of the growth.

Ovulogenous Ovarian Tumors ; Dermoids and Teratomata. —The Ovulogenous Neoplasms.—Dermoids [1] of the ovary differ from dermoids of other parts of the body. There is a spherical ovarian tumor with a firm white capsule, usually moderate in size, filled with fatty or so-called sebaceous matter and hair, but having on one part of its otherwise smooth internal wall an elevation or thickening of varying size which is an imperfect embryo, with all three of the blastodermic membranes represented, the ectoderm showing the greatest development, the mesoderm the next, and the entoderm the least The cephalic region is commonly much more advanced in growth than the other embryonal structures, so that besides the hair and fluid fatty matter, jaw-bones and teeth are the most easily recognizable fetal parts The hair, which often fills the tumor in a tangled mass, but is sometimes present in tresses more than three feet long, always grows from one portion of the embryonal region, representing the scalp.[2] It is usually of a reddish color, but may be black or brown

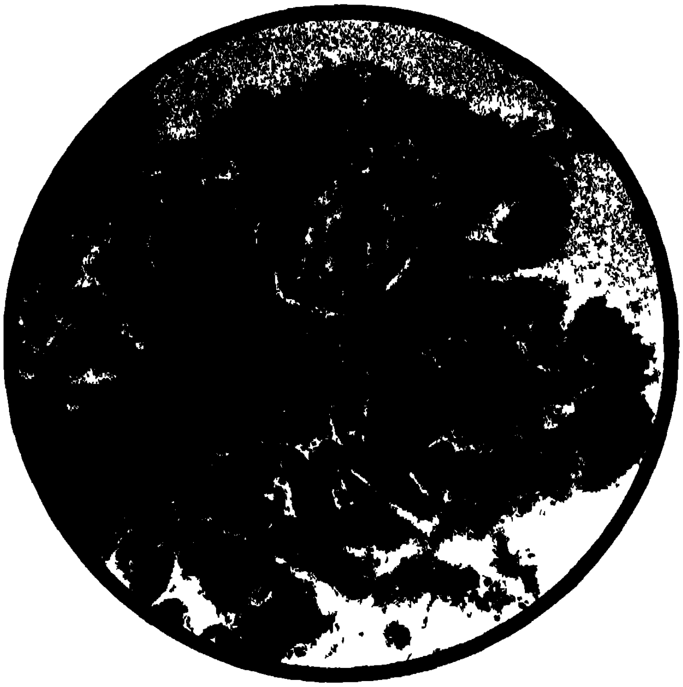

Fig 424.—Malignant degeneration of papillary ovarian cyst (McConnell and J. C Hirst).

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[1] "Embryomata" would be a more appropriate and accurate name for these tumors

[2] In one reported case there was a growth of hair at the scalp and at the mons veneris.

Directly beneath this region, on section, possibly with some plates of bone intervening, is found a substance representing the brain. Next to it are the structures representing the jaw-bones, usually in miniature, but sometimes of natural size.[1] From this region the teeth grow, in some cases in astounding numbers. More than 300 have been found in one specimen. The rest of the embryonal region is commonly a confused jumble of muscle fragments, cartilage, and structures lined with columnar epithelium representing the entoderm. Rarely there may be a more perfect development of the fetal body or of certain parts of it There have been found ribs, pelvic bones, jointed long bones, fingers, hands or their rudiments, lower extremities, thyroid, submaxillary and mammary glands, some of them secreting colostrum and one of them undergoing cancerous degeneration.[2] In a specimen removed in the Howard Hospital there was a well-developed eye. Regnier's case had a complete skeleton, perfect on the right side to the phalanges [3]

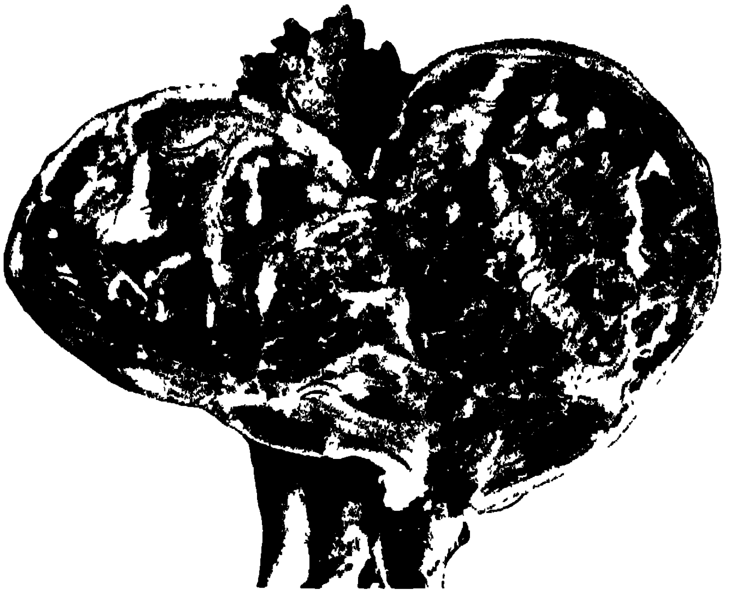

Fig 425 —Section of an ovarian dermoid or embryoma.

Dermoids may be multiple; five and seven have been found in one tumor. It is not very unusual to find dermoids in both ovaries, though in the author's experience this is a much rarer occurrence than most statistics indicate. (Olshausen found it in 33 per cent.)

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[1] In one of my specimens in the Howard Hospital there is a perfect half of a lower jaw in miniature with the incisor and canine teeth, in a dermoid tumor no larger than a crab-apple.

[2] Yamagiva, "Virchow's Archiv," Bd cxlvii, H 1.

[3] Pfannenstiel, Veit's "Handbuch," vol. iii, p. 370.

A dermoid cyst is usually combined with a simple serous cyst or a pseudomucin cyst of the ovary. In the latter case the embryonal area is attached to the wall of the main cyst cavity. The fluid contents of the cyst are composed mainly of fat, desquamated epidermis cells, cell detritus, and occasionally cholesterin crystals. At the temperature of the body the mixture is fluid; at a lower temperature it coagulates to a cheesy consistency.

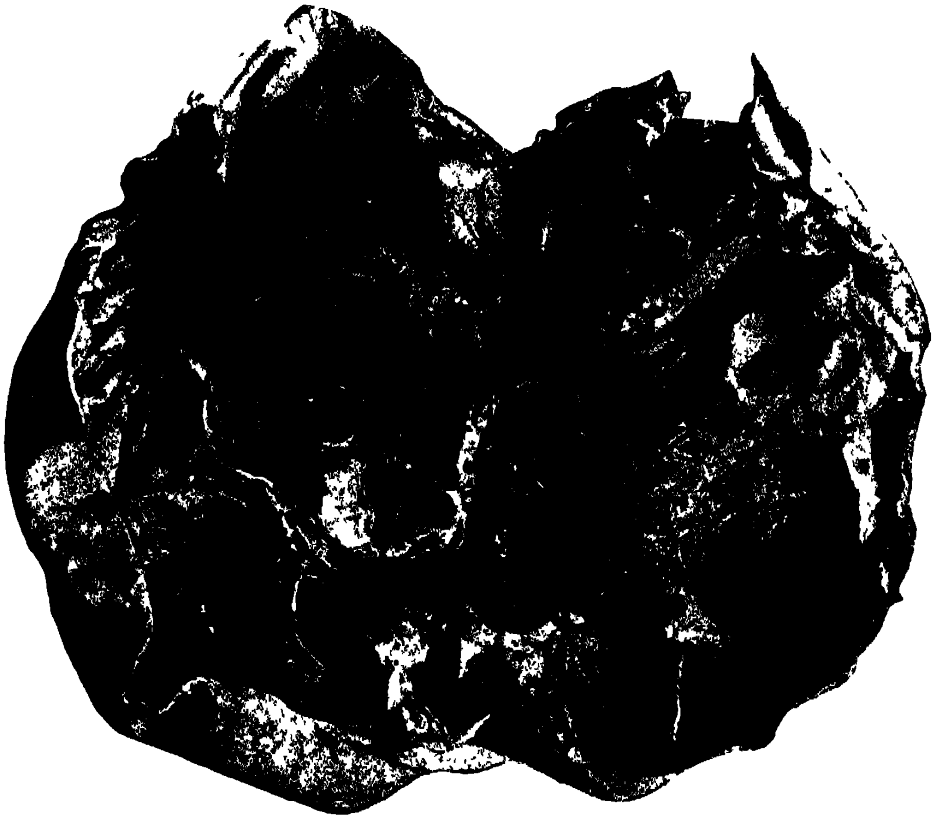

Fig 426 —Section of a pseudomucin cyst and an associated dermoid or embryoma in its interior

Fat globules the size of a cherry have been found floating in a thinner fluid. They are formed by concentric layers of fat deposited around a kernel of cholesterin.

Frequency—According to Pfannenstiel, 7.5 per cent. of all ovarian tumors contain a dermoid. But the proportion is considerably smaller if one counts as dermoid cysts only the tumors in which the dermoid is a predominant feature.

Clinical History—Dermoids may be found at any age, but they are most frequently discovered during the period of sexual activity, from puberty to the menopause. They are exceedingly slow in growth, and may be contained in the abdomen twenty years or more. They may remain stationary in size for indefinite periods, giving rise to no symptoms. From the length of time that they are carried in the abdominal cavity they are exposed to the complications common to all ovarian tumors: twisted pedicle, necrosis, gangrene, rupture and injury in labor. In consequence of their moderate size, spherical outline, and pedunculated form they are liable to become impacted in the pelvis and to give rise to pressure symptoms. They appear to respond more rapidly to the stimulus of pregnancy to growth than the other ovarian cysts, and it is not unlikely that pregnancy may rarely be the starting-point of a parthenogenetic development in the ovary. The proportion of dermoid cysts complicating gestation is larger than it should be, considering their proportion to other ovarian tumors.[1]

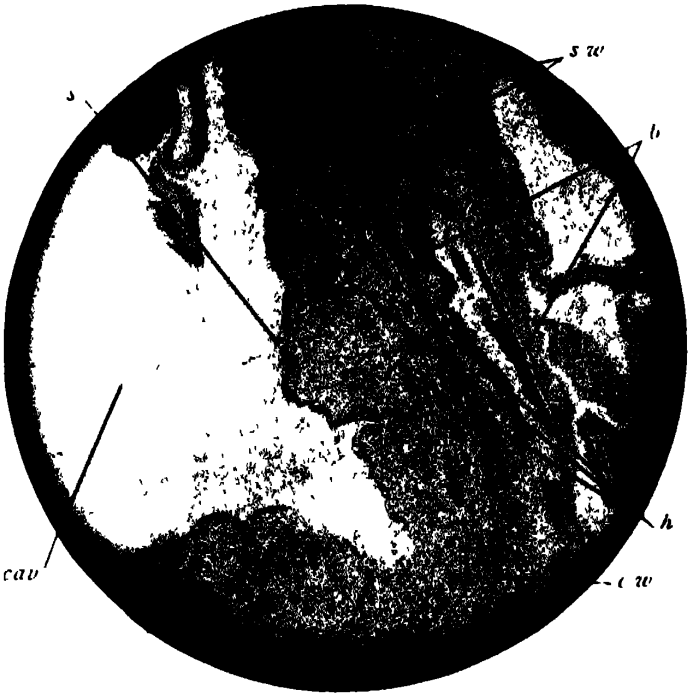

Fig 427 —Dermoid cyst of ovary, showing squamous epithelium, hair follicles, sebaceous gland, and bone: *s*, Squamous epithelium; *s w*, sebaceous glands; *b*, plates of bone; *h*, hair follicles; *c.w*, cyst-wall; *cav*, cyst cavity (McConnell and J C Hirst)

Rupture of a dermoid cyst and the setting free of the dirty-looking and putrescible contents into the peritoneal cavity have been regarded with anxiety. The contents of the cyst are, however, sterile, and if evacuated during an operation and immediately cleaned out should not cause inflammatory trouble. If some time elapses between the rupture and the abdominal section, the results may be more serious. The patient may die of a putrefactive peritonitis after the abdomen is opened, or the cyst contents may be encapsulated in numerous areas over the peritoneum, giving the appearance of implantation metastases, and single hairs may be caught in the peritoneal exudate by their ends, making them look as though they grew from the peritoneum.[1]

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[1] In eight operations for ovarian cysts complicating the child-bearing process I have found dermoids three times.

A dermoid cyst is a benign growth. It may in rare instances be associated with malignant tumors of the ovary and it may itself very rarely undergo malignant degeneration. In addition to Yamagiva's remarkable case of mammary cancer in a dermoid, ten cases of squamous-cell cancer, originating in the embryonal area, have been collected by Wilms and Pfannenstiel

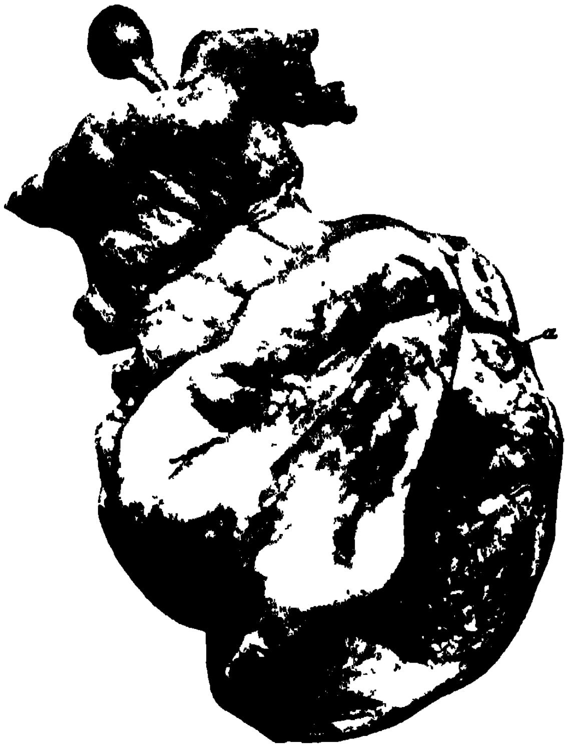

Fig 428 —Dermoid tumor of ovary with a well-developed eye : *a*, Well-formed eye in the embryonal area (Howard Hospital)

Etiology.—The only satisfactory explanation of a dermoid tumor in the ovary is a parthenogenetic development from an ovule which is stimulated to growth perhaps by some other tumor formation such as a simple serous cyst or a pseudomucin cyst. As both these tumors are derived from the follicular epithelium the stimulus their growth would impart to one or more ovules in the follicles is evident. What determines the growth of the ovule in some instances and not in others is still a mystery.

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[1] In one of my cases a very large cyst was ruptured while the abdomen was being scrubbed the day before the operation. On the following day the abdominal cavity was found full of the sebaceous contents that clung so tightly to all the peritoneal surfaces by adhesive inflammation that it was absolutely impossible to wash or wipe it away After a prolonged effort to cleanse the abdomen it was closed with a large amount of the cyst contents remaining in it. The patient died within twenty hours of a putrefactive peritonitis.

Teratomata of the ovary are very rare. According to Krömer, there are only ten recorded cases.[1] They have the same histogenesis as ovarian dermoids, but clinically they differ considerably. They are solid tumors, reach an enormous size, are sometimes pedunculated, sometimes intraligamentary. The capsule is smooth, composed of connective-tissue layers, containing histological traces of ovarian structure. Internally the tumor is divided by fibrous trabeculæ into small spaces which contain young connective tissue, of a brain-like consistency, reddish-gray in color, extremely prone to sarcomatous degeneration, if not always sarcomatous. Small cysts are scattered through the tumor The embryonal structures are intermingled and confused in the most extraordinary manner. All three blastodermic membranes are represented, but the structures derived from them are scattered through the tumor without the least trace of orderly arrangement; bits of cartilage, nervous tissue, muscle, fat, and bone may be found jumbled together.

The ovarian teratomata are clinically malignant growths, of the sarcoma group.[2]

Carcinoma of the ovary may be primary or metastatic, or it may be due to a carcinomatous degeneration of an adenoma or dermoid. The first named is the most frequent. It is usually a medullary cancer diffusely infiltrating the ovary, but may be scirrhous. The tumor may be solid, is usually spherical in shape and pedunculated. The cystic cancers are a commoner form than the solid. They are multilocular, the cyst spaces containing a serous fluid, which may resemble pus on account of the desquamation of epithelial cells, or may be mixed with blood. According to Pfannenstiel, the cystic cancers are as a rule papillary, and almost half of all papillary ovarian tumors are adenocarcinomata. On section the tumor in its solid portions has a brain-like consistency very different from anything seen in the cystadenomata.

Adenocarcinoma may be secondary to the same growth in the uterus or the bowel. So-called colloid cancers are usually pseudomucin cysts with very small and numerous loculi, but there is a form of carcinoma in which the epithelium penetrates the connective tissue in proliferating nests, resembling the macroscopic appearance of a pseudomucin cyst.

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[1] Jung reports two additional cases ("Monatsschr f Geburtsh u Gyn," Bd. xiv, p 646).

[2] Jung and others question the invariable malignancy of these growths, but acknowledge the tendency to malignant degeneration (*loc. cit.*).

Cancer of the ovary is commonest in elderly or middle-aged women, but it occurs at the time of puberty and in childhood. It is usually bilateral. The rate of growth is rapid except in the scirrhous form. There is almost always ascites unless the growth is intraligamentary. Edema of the thighs is the rule, and swelling of the inguinal glands is not uncommonly observed. The general health may be well preserved for a considerable time, but

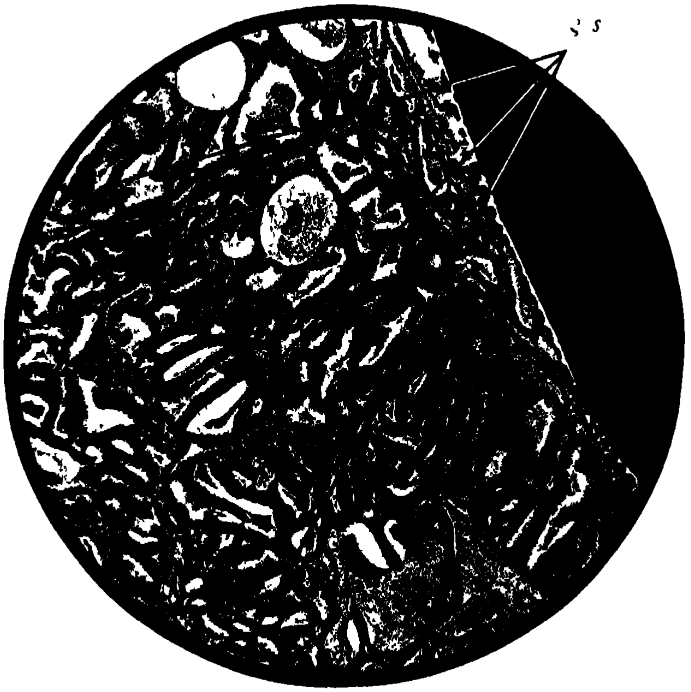

Fig 429 —Malignant adenoma of ovary : g s, Gland-spaces, communicating and lined with hyperplastic columnar epithelium (McConnell and J. C Hirst)

cachexia at length appears. Pain is a variable symptom. In most patients it appears early and is intense. It may be entirely absent. Constipation and tympany are usually marked. The diagnosis is always difficult to make. Many cases of ovarian cancer give the impression of a uterine fibroid. As the size of the growth is moderate, an immediate operation is frequently not advised. By the time that the condition admits of a diagnosis, the operative treatment is usually hopeless. Under all circumstances the prognosis is unfavorable. There is a recurrence in three-fourths to four-fifths of the cases. Both ovaries should always be removed, even though one is apparently healthy.

Stromatogenous Neoplasms.—Fibromata of the ovary are characterized by a diffuse growth of the connective-tissue elements often containing unstriped muscle-fibers converting the ovary into a fibromyomatous tumor, with a disappearance in great part of the parenchyma. The growth is moderate in size, somewhat irregular in outline, white in color, hard in feel, and heavy. It is occasionally bilateral and may be associated with uterine fibroids. It is usually pedunculated, but may be intraligamentary The rate of growth is extremely slow. The tumor gives rise to few symptoms and may be carried for a lifetime by the patient without much inconvenience. It occurs at any time of life from infancy to advanced old age The most curious clinical feature of ovarian fibromata is the frequency of ascites, which has been variously explained by a mechanical irritation of the peritoneum, a congestion of the broad ligament, and a chemical irritation of the peritoneum by secretions from the tumor.

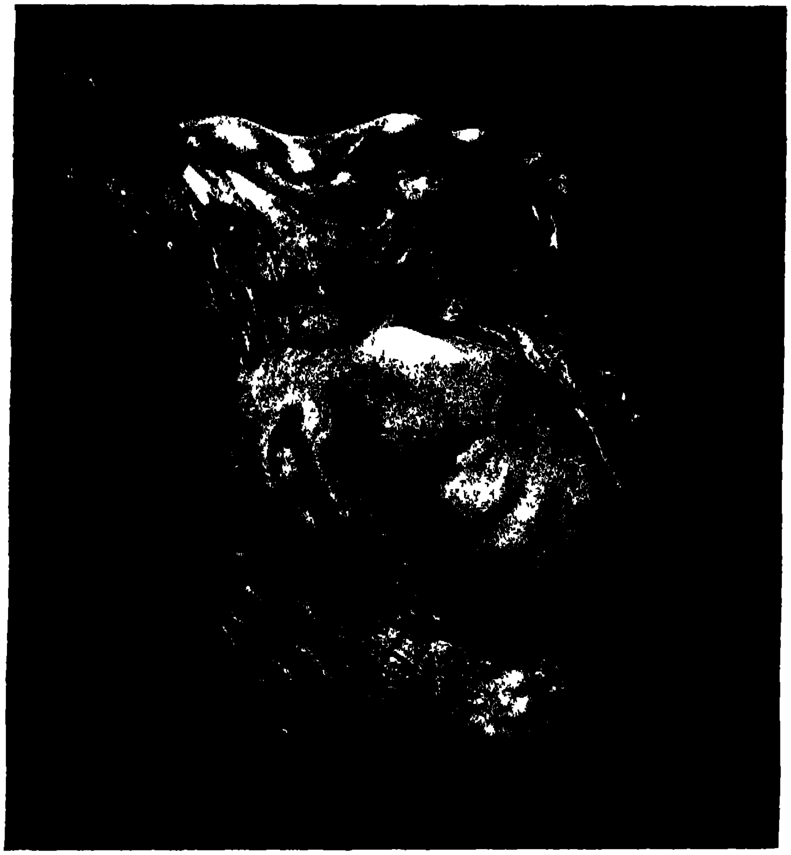

Fig. 430.—Fibroma of the ovary.

Fibromata of the ovary are entirely benign They do not recur. The ascites which they cause disappears after their removal. They are subject to all the degenerations of a fibroid tumor and to the accidents of an ovarian tumor (twisted pedicle, displacements, incarceration in the pelvis). They constitute about 2 per cent. of all ovarian tumors

Rokitansky describes a fibroma of the corpus luteum with a fibrous core the size of a walnut surrounded by a membrane which may present the typical folds of a lutein membrane.

Sarcomata and Endotheliomata of the Ovary.—The ovarian sarcomata are spindle, round-celled, or mixed. The first-named resemble fibromata. There is a fibrosarcoma which is difficult to differentiate from a fibroma and which is scarcely malignant. The round-cell sarcomata are soft in consistency, rapid in growth, and resemble macroscopically medullary cancers of the ovary. Degenerative changes occur early and to a marked degree. The ovarian parenchyma is soon destroyed.

Fig. 431.—Fibroma of ovary (McConnell and J C. Hirst).

The endotheliomata of the ovary, derived from the lymphatic and vascular endothelium, are an intermediate form of growth between the cancers and the sarcomata. According to Pick, they assume three forms: circumscribed collections of chains of cells, tubular gland-like formation of cells, and a distinct sarcomatous type with a slight indication of alveoli. Sarcoma of the ovary develops at any time of life, but is most frequent in women slightly under middle age. The younger the patient, the more likely is the growth to be a round-cell sarcoma. The tumor is frequently bilateral and is usually associated with ascites. It is not quite so malignant as cancer of the ovary Permanent cures by operation have been obtained in 50 to 75 per cent. of the cases. According to Pfannenstiel's statistics, sarcomata constitute 5 per cent. of ovarian tumors

Angiomata of the ovary have been described.[1] *Enchondromata* and *osteomata* occasionally reported are no doubt teratomata. Pick [2] has described a tumor of the hilus of the ovary derived from Marchand's accessory suprarenal bodies, with a malignant tendency; Gottschalk,[3] a malignant tumor springing from the follicular epithelium, *folliculoma malignum*. A combination of some of the ovarian tumors described above may be observed, as of dermoids and pseudomucin or simple serous cysts, cystadenomata and sarcomata, or carcinomata, etc. A serous cystadenoma is almost never associated with a dermoid or a pseudomucin cyst on account of the origin of the one from the surface germinal epithelium, and of the others from the follicular epithelium

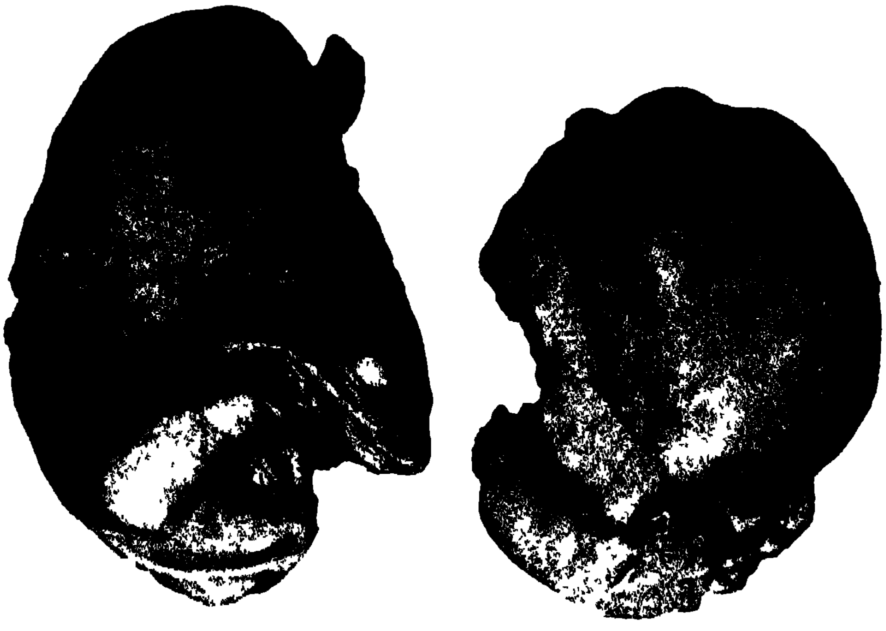

Fig. 432.—Sarcoma of both ovaries, removed from a child of seven years.

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[1] Veit's "Handbuch der Gyn," vol. iii, p. 403

[2] "Arch. f Gyn," Bd. lxiv.

[3] *Ibid.*, Bd lix.

Parovarian Cysts.—It is convenient to describe cysts of the parovarium in the section on ovarian tumors, with which they have much in common in clinical history, symptoms, and treatment.

Parovarian cysts are derived from the parovarium, or in exceptional cases perhaps from an accessory tube. They constitute from 9 to 11 per cent. of the cystic tumors of the ovary and broad ligament. They occur most commonly from the thirtieth to the fiftieth year or at puberty. They are usually unilocular, though not invariably so; their capsule is a thin, flaccid, connective-tissue structure, over which the peritoneum of the broad ligament is freely movable. The tube runs over and behind the tumor, being sometimes lengthened to 40 centimeters or more, with an ovarian fimbria measuring as much as 10 centimeters in length. The ovary is occasionally merged in the wall of the tumor and drawn out to an extreme length, but usually it is quite independent of the growth. The tumor cavity is lined with a single layer of columnar ciliated epithelium, which is occasionally degenerated and flattened by intracystic pressure or deprivation of blood-supply. The blood-vessels run in the tumor-wall and are entirely distinct from those of the broad ligament. The contents of the

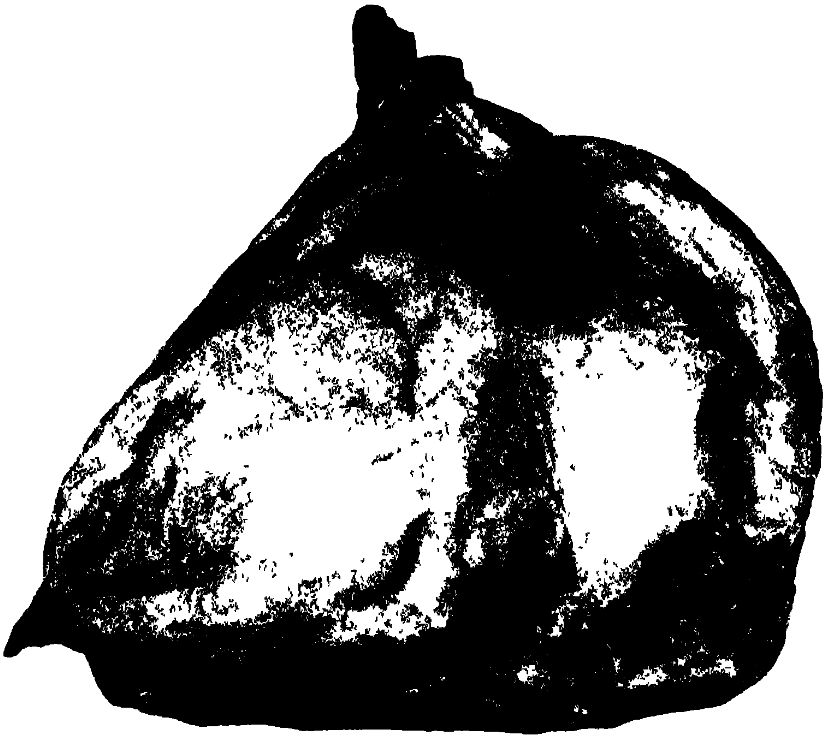

Fig 433 —Large parovarian cyst, pedunculated

cyst are a clear liquid, almost colorless, slightly opalescent, of low specific gravity, containing neither mucin nor albumin. In large parovarian cysts the color of the fluid and its density may be altered by degenerative processes or hemorrhagic effusions.

The growth is necessarily intraligamentary, but large tumors are usually pedunculated, the pedicle consisting of the tube, broad ligament, and the ovarian ligaments.

The tumor-walls are so flaccid that the form of the tumor varies remarkably in different postures. The shape of the abdomen in the supine position suggests ascites, but there is resonance in the flanks. Fluctuation is distinct on percussion.

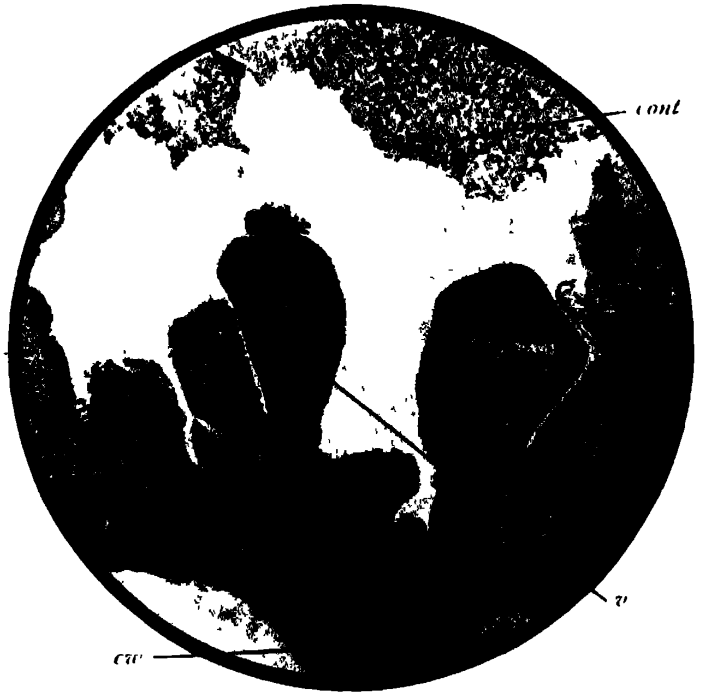

Fig. 434.—Cyst of the parovarium: *cont*, Cyst contents; *cw*, cyst-wall; *v*, villi (McConnell and J. C. Hirst).

Parovarian cysts are usually moderate in size and slow in growth, but they may be enormous. The author has removed two which taxed the capacity of the abdomen to the utmost They give rise to very few symptoms and to little inconvenience unless they attain a large size. They are absolutely benign, not recurring when removed. Rupture frequently occurs on account of the tenuity of the walls. Sometimes a spontaneous cure occurs in this way, but the cyst usually refills slowly. Ordinarily the tumor is unilateral, but both broad ligaments may exceptionally be affected. Papillomatous outgrowths have been observed in parovarian cysts, but they are usually fibrous in character and not luxuriant in growth. The unilocular thin-walled cyst is almost the only tumor of the parovarium, but the following neoplasms of this structure have been reported : papillary cystadenoma, carcinoma, adenosarcoma, multicystic adenoma, fibro-adenoma, and fibrosarcoma (Pfannenstiel).

Clinical History of Ovarian Tumors.—There is often a complete absence of symptoms until the ovarian cyst reaches such a size as to attract attention by the distention of the abdomen. There are usually none of the local pains or reflex symptoms so common to other forms of ovarian disease, except that there is not infrequently an excitation of the breasts and colostrum secretion. Pressure symptoms of the bladder and bowel may, however, appear early, and are most severe in intraligamentary growths. Pain is almost entirely absent unless the growth is malignant, or there are pressure symptoms, twisted pedicle, necrosis or infection of the tumor. Ascites is associated with malignant growths, fibromata, and papillomata, and may be the chief cause of complaint If it is exaggerated there is usually an associated pleural effusion and embarrassed respiration. Most often in consequence of ascites, sometimes without, there may be a prolapse of the uterus or vagina in women predisposed to that displacement, due to the increased intra-abdominal pressure. The menstruation is often quite unaffected. It is not infrequently scanty, irregular, or suppressed. The coincidence of suppressed menstruation and an abdominal tumor has often given rise to the mistaken diagnosis of pregnancy.

In tumors that destroy both ovaries, as bilateral malignant growths, there is usually amenorrhea. In intraligamentary papillomatous growths, on the contrary, menorrhagia is the rule

The duration of an ovarian growth varies greatly with its nature, and is variable in individual varieties. Round-cell sarcomata in young people grow with the greatest rapidity Carcinomata are usually quite rapid in growth. Fibromata and fibrosarcomata are exceedingly slow in development. The glandular cysts vary greatly in individual instances in their rate of growth In the older literature cases are recorded of ten, fifteen, and even fifty years' duration. On the average, according to Olshausen, 60 to 70 per cent of women with glandular cysts die within three years and another 10 per cent. in the fourth year.

One scarcely ever sees at present the enormous cysts that were common in a former generation. It is rare, therefore, to observe the emaciation, the pressure symptoms on abdominal and thoracic contents, the enormous distention of the abdominal wall, with the enlarged veins and striæ under the skin that are associated with tumors of the largest size. All ovarian tumors, but most particularly the glandular and dermoid cysts, are liable to the complications of twisted pedicle, rupture, inflammation and suppuration.

Twisted Pedicle.—As already stated, an ovarian tumor is usually twisted on its pedicle by 90 degrees in the course of its normal migration, during its growth, from the pelvis to the abdomen. The movement is almost always from within, outward and forward, so that a right-sided tumor would turn to the right and forward, a left to the left and forward. This movement makes of the pedicle a left spiral on the right side, a right spiral on the left side. In consequence of the pressure of intestines to one side of and behind the growth, sudden movements, relaxed abdominal walls, especially after childbirth, gynecological examinations, or other causes not clearly understood, the tumor, especially if it is moderate in size, with a spherical shape and smooth walls, may be twisted on its pedicle by one-half to seven complete turns. The result is a more or less complete strangulation of the growth: its walls are bluish-black in color, there is a sudden increase in size, a consequent tension of the walls which may rupture, and an intracystic effusion of blood, which, if the walls rupture, may become intraperitoneal and may prove fatal. If the arterial supply is completely cut off, necrosis of the tumor necessarily follows. The pedicle has been completely severed by torsion and the tumor has been set free in the abdominal cavity, contracting adhesions to the omentum and bowels and deriving nutriment from their blood-vessels. In any event from the destruction of the surface epithelium, extensive adhesions are likely to form between the tumor-wall and neighboring structures

Thrombosis of the veins in the broad ligament is not uncommon and may be so extensive as to be a serious source of embarrassment in placing the ligature around the pedicle It may be necessary to include a large thrombotic vein, as in one of the author's cases, and pulmonary embolism may be the result.

The symptoms of twisted pedicle are peritonitis, high temperature, rapid pulse, and in case of profuse intracystic or intra-abdominal bleeding, shock and collapse. The peritonitis is not infectious, as the abdominal contents are sterile. In the presence of these symptoms and with the physical signs of an abdominal or pelvic tumor the diagnosis is easily made. Hemoglobinuria has been observed.[1]

The treatment is the removal of the tumor as soon as practicable. The adhesions which are early formed are light and easily broken ; later, when they are better organized, they are extremely dense and firm. While the peritonitis is not at first infectious, micro-organisms may find their way to the partially or wholly necrotic tumor from the bowels or tubes, and it may become gangrenous. Even if the patient survive the primary symptoms of the twisted pedicle, she is likely to be bedridden for a long time while absorbing the necrotic portions of the tumor, and she may at any time become septic. Nothing is gained, therefore, by delay, and the results of immediate operations are usually very satisfactory. Before ligating the pedicle, it should be untwisted. Unusual care should be exercised in handling the growth so as not to rupture its walls and to set free in the abdominal cavity the bloody putrescible contents; but if to diminish its size, or accidentally the wall is punctured, the toilet of the peritoneum should be carefully made.

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[1] Kober, "Deutsche med. Wochenschrift," 1901, p. 131

Rupture.—In consequence of a blow, a fall, a gynecological examination, cleansing the abdomen preparatory to a section, the straining of the abdominal muscles in labor, vomiting, defecation, coitus, simply turning in bed, or often inexplicably, an ovarian cyst may rupture. A thin-walled cyst, especially a parovarian cyst, is most liable to the accident, but a thick-walled dermoid and all varieties of ovarian cysts may rupture. As the ruptured cyst is usually a thin-walled tumor with simple serous contents, no ill effects follow the rupture. An ovarian tumor may be permanently cured in this way, but usually the cyst refills. Repeated ruptures and reaccumulation of fluid are reported. If the cyst is a pseudomucin cystadenoma or papillomatous, rupture may be followed by implantation metastases. If it is a dermoid, the cystic contents excite an irritative peritonitis with symptoms of auto-intoxication, and if the abdomen is opened shortly afterward, the cyst contents may be so embedded in peritoneal exudate as to make its complete removal impossible, may putrefy, and may destroy the patient by a septic peritonitis. The rupture of a suppurating cyst is naturally followed by septic peritonitis. Occasionally there may be intracystic or intra-abdominal bleeding with symptoms of collapse and shock. Very rarely these symptoms may appear and may prove fatal without bleeding, though commonly, as already stated, rupture of an ovarian cyst is not a dangerous accident.

The diagnosis is made by the history of an accident or strain followed perhaps by the disappearance of an abdominal tumor noticed by the patient, occasionally with some symptoms of peritoneal irritation, as pain, vomiting, tenderness and tympany, rarely with the graver symptoms described above. On examination it may be impossible to find a trace of tumor if it had been a simple monolocular serous cyst and was completely emptied by the rupture. In other cases the tumor may be felt with flaccid or collapsed walls. Free fluid may be demonstrated in the abdomen, perhaps in considerable quantities, for in addition to the cyst contents an ascites may be excited by the rupture.

The treatment of a ruptured cyst is not necessarily an immediate section. In the case of a thin-walled monolocular cyst, it is better to give the patient the rather remote chance of a permanent disappearance of the cyst, operating, however, if it refills. In the event of serious symptoms, or if one suspects the ruptured cyst to be papillomatous, pseudomucin, or dermoid, an immediate operation is required.

Inflammation and suppuration of ovarian cysts most often occur in the puerperium, since the practice of puncturing them has been given up. The infecting agents are the same as in acute infectious oophoritis and the route of infection is likewise the same—namely, from the tubes, the bowels, by way of intestinal adhesions, from the blood, and by the lymphatics and connective tissue of the hilus. Dermoids are more subject to suppuration than other ovarian cysts because they are so long retained in the pelvis, where they are liable to injuries and inflammations, and because of their tendency to twisted pedicle.

The symptoms are fever and those of infection generally or of septic intoxication There may be an entire absence of peritoneal symptoms and the suppuration is usually localized strictly within the capsule of the tumor.

The treatment is the earliest possible removal of the cyst entire without puncture. A delayed operation entails the danger of profound septic intoxication or pyemia, to which the patient succumbs in spite of the successful removal of the tumor, or of a rupture of the suppurating cyst into the peritoneal cavity, the bladder, the bowel, the vagina, or even externally through the abdominal wall. The partial evacuation which follows the rupture does not effect a spontaneous cure: the patient eventually dies of exhaustion or pyemia. Rupture into the peritoneal cavity naturally causes suppurative peritonitis and speedy death.

In desperate cases it may be essential to save every instant of time in the operation and all possible shock It is a safe plan in such cases to make a small incision, sew the tumor-wall to the peritoneum with a few stitches, puncture the cyst, and drain its cavity without attempting its removal, which can be undertaken later or may be unnecessary, as adhesive inflammation may obliterate its cavity and the capsule may shrink to a fibrous band [1]

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[1] By this plan the author saved a patient by an operation that had been declined by the late Wm. Goodell as necessarily fatal. The tumor had been a multilocular pseudomucin cyst, but all the loculi were merged in one by the destruction of the septa. The infection followed a vaginal puncture in labor

The Symptoms and Diagnosis of Ovarian Tumors.—Pedunculated growths, unless they are malignant, rarely give rise to symptoms until their size attracts attention. They may, however, as small tumors in Douglas's pouch, cause constipation, tympany, and other bowel disturbances by pressure on the rectum, or, if in front of the uterus, pressing upon the bladder may occasion vesical irritability or dysuria. Reflex symptoms are rare, but the breasts not infrequently display functional activity and manifest the signs usually indicative of pregnancy. The effect of an ovarian tumor on menstruation is variable. Often there is no change in the periods, but quite frequently the menstrual discharge is scanty, irregular, and infrequent, suggesting the idea of pregnancy and leading to a mistaken diagnosis. Intraligamentary growths cause local disturbance, as a rule, early and to a marked degree on account of the pressure to which they and their surroundings are subjected in the attempt to expand between the layers of the broad ligament and in the pelvic connective tissue. A thin-walled parovarian cyst may be an exception to the rule and often causes little or no discomfort Intraligamentary cysts usually produce menorrhagia, particularly if they are papillomatous. Malignant growths may early be associated with great pain and there is a rapid development of ascites Ascites, however, is not distinctive of malignancy; it occurs in ovarian fibromata, superficial papillomatous growths, and in implantation metastases of pseudomucin cysts. It is possible with any form of ovarian tumors. In the later stages of an ovarian cyst the enormous abdominal distention, the emaciation of the patient's body

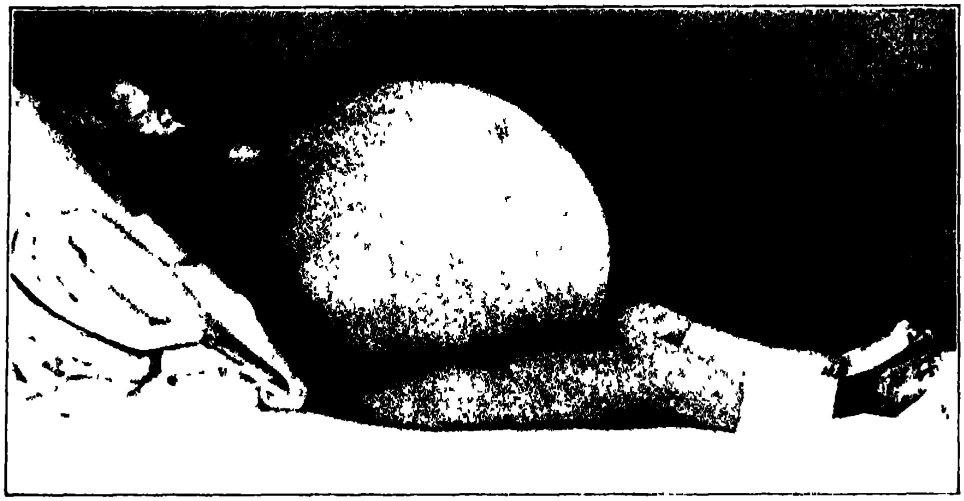

Fig. 435 —Large ovarian cyst in a Chinese woman. Weight of tumor, 182½ pounds; fluid contents, 22 gallons (Museum of the College of Physicians, Philadelphia)

and limbs, making her look like an appendage of the tumor, her incapacity, embarrassed respiration and heart action, and digestive disturbances are all so striking that it is impossible to mistake the condition; but such cases to-day are rare. An ovarian cyst is scarcely ever permitted to exceed the size of a full-term pregnancy

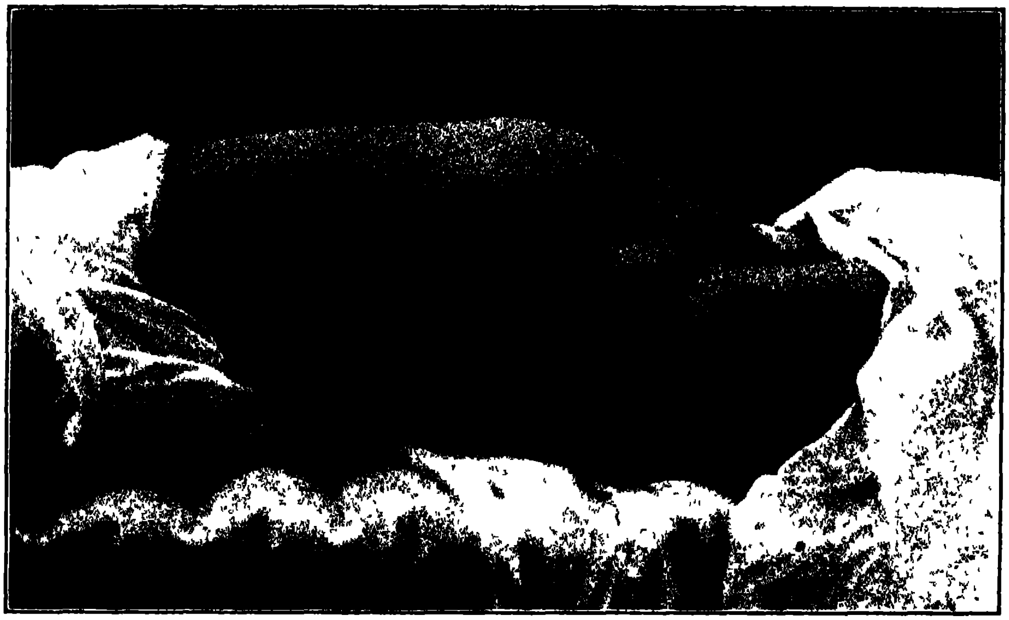

Fig. 436.—A ten pound multilocular ovarian cyst displaced under ribs, without adhesions, right side; probably from tight lacing.

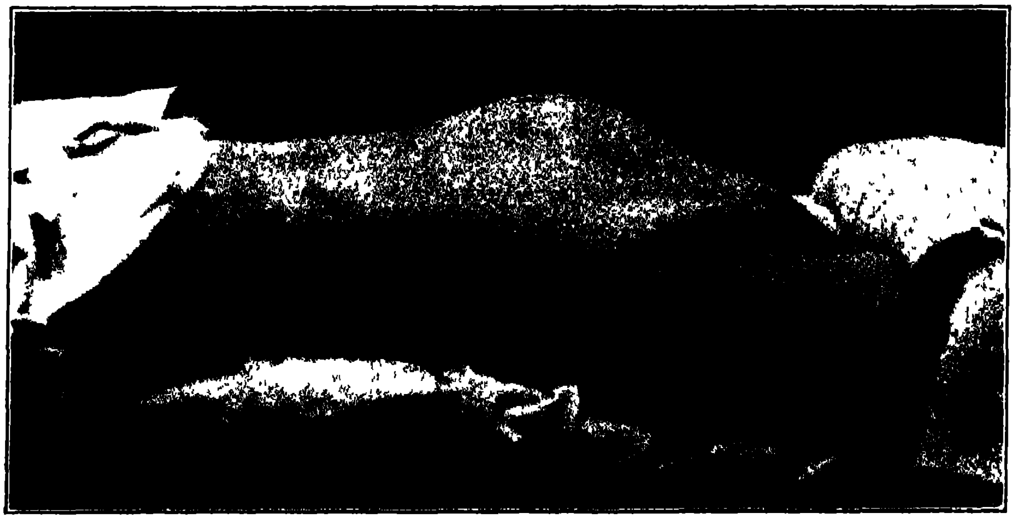

Fig. 437.—Multilocular ovarian cyst adherent in upper segment of abdomen to liver, stomach, and intestines. Lower segment of abdomen perfectly free. Removed four weeks after confinement

The examination of a woman suspected to have an ovarian tumor should be methodically and carefully conducted. In small growths still within the pelvis a bimanual examination alone is sufficient. The bowels and bladder should be emptied. The patient is arranged on a suitable table with her trunk flexed and the pelvis slightly elevated. The position and size of the uterus are first determined, and then the tumor is caught between the finger-tips, its position, size, consistency, and mobility noted. It may be possible to make out its connection with the uterus by the ovarian ligament and the tube. While it is always interesting to surmise the nature of the ovarian growth, the differential diagnosis before the abdomen is opened is of little importance, as they all require operative treatment, and a too persistent or rough palpation may easily rupture the tumor, twist its pedicle, or cause necrosis. Certain facts, however, may be remembered with advantage: Solid tumors are fibromata, sarcomata, carcinomata, or teratomata, ascites usually accompanying them; fibromata are small in size, hard in feel, extremely slow in growth, have a comparatively smooth outline, are pedunculated and freely mobile. Carcinomata and sarcomata are irregular in outline, usually bilateral, soft in consistency, and adherent. Of the cystic growths the fluid contents are most evident in simple serous cysts and parovarian cysts, the latter having thinner walls. Dermoids have an indistinctly cystic feel, an almost doughy consistency, and a regular spherical outline. They may

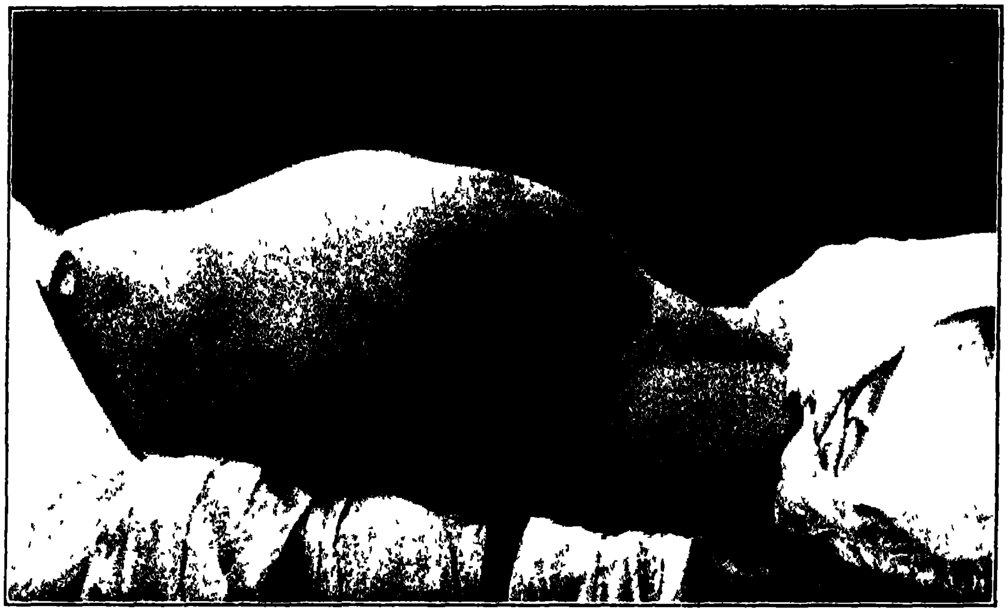

Fig. 438.—Ovarian cyst twisted on its pedicle, removed on the sixth day of the puerperium. The distention of the upper abdomen is due to tympany.

empty into the bladder or bowel and discharge characteristic contents with the urine or feces. A radiograph may show their bony contents. If they lie in front of the uterus and are displaced to the side from which they grow, they immediately return to their former position (Küster's sign; not positive). Pseudomucin cysts are often irregular in outline and consistency; a distinctly cystic area may be bordered by solid lumpy masses. Serous glandular cysts, if they are intraligamentary and papillomatous, especially if the papillomata are superficial, may present the physical signs of a solid malignant tumor.

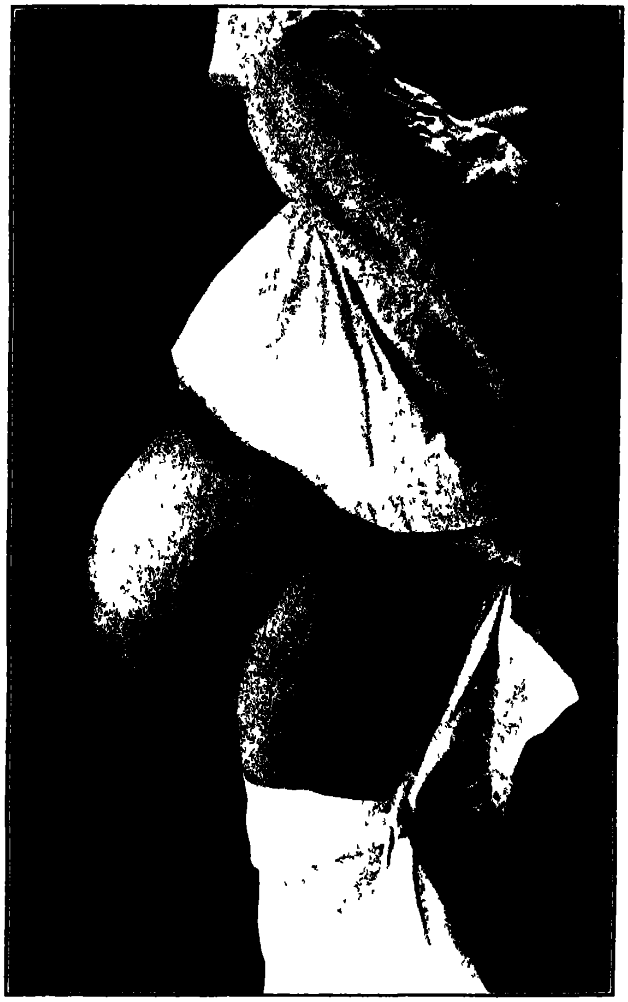

Fig 439.—Obesity. Referred to author as an ovarian cyst The finger-tips on the flanks could be approximated under the tumor. Resonant note on percussion everywhere.

It is sufficient for all practical purposes to recognize an ovarian tumor which must be removed. The exact differential diagnosis can be made when the abdomen is opened. In the examination of large ovarian tumors, inspection, palpation, and percussion of the abdomen must be practised in addition to the combined or bimanual examination. The appearance of a very large cyst is distinctive: The huge spherical abdomen, with distended veins in the skin, the emaciated body, face, and limbs present a spectacle easily recognizable. Moderate-sized growths cause no typical change in the abdomen. The distention might just as well be due to pregnancy or any other abdominal tumor. Occa-

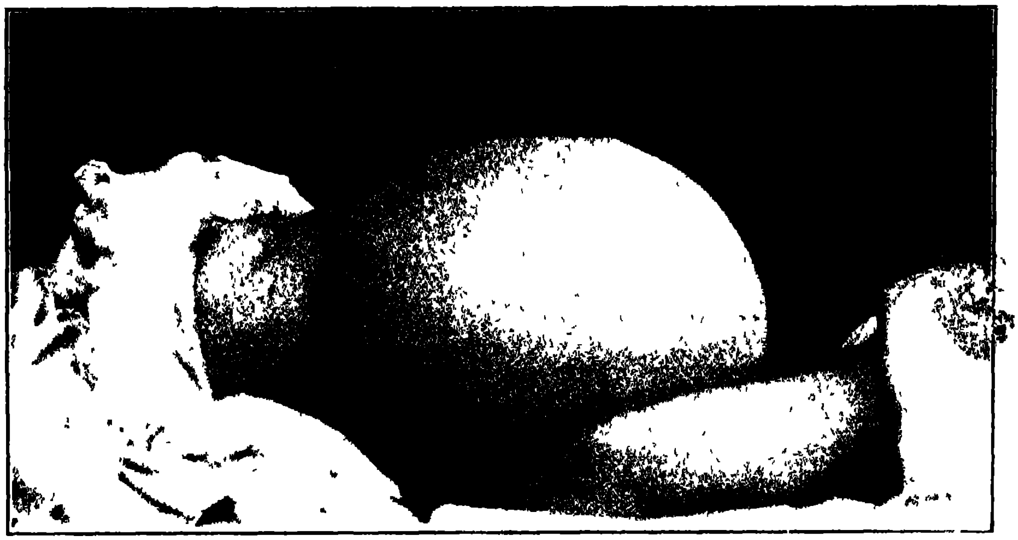

Fig. 440.—Ascites with sarcoma of the uterus. Sent to Howard Hospital as an ovarian cyst. No corona of resonance; shifting dullness with changes of posture. Uterine tumor appreciable on bimanual examination.

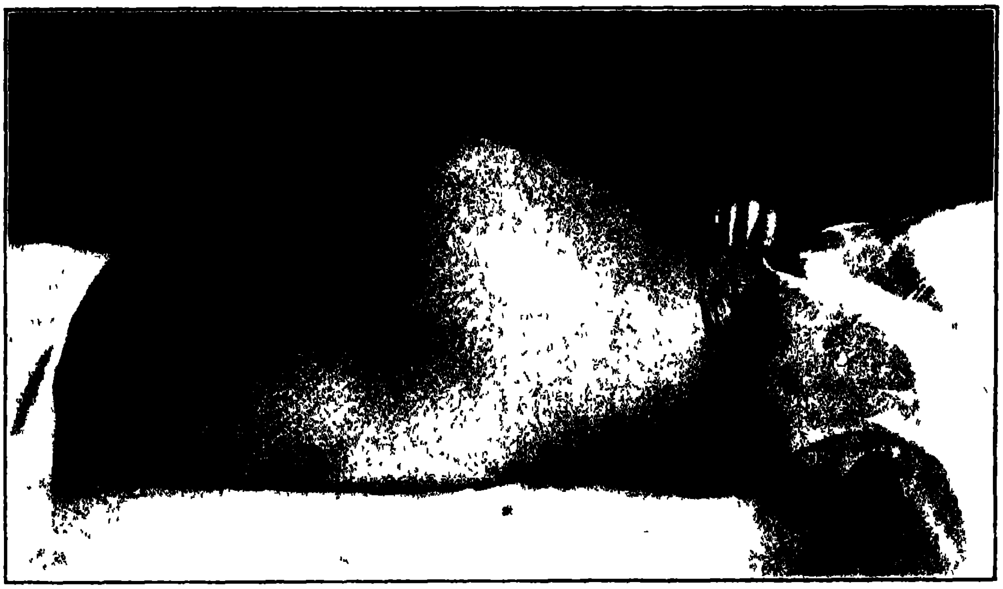

Fig. 441.—Ascites from cirrhosis of the liver. Pyramidal abdomen; other signs of ascites as above. Referred to author for operation as an ovarian cyst.

sionally the cyst is displaced into the upper abdomen and is apparently unconnected with the pelvic organs.[1] Not infrequently an irregularity in outline of the tumor is evident through the abdominal wall, indicative of a pseudomucin cyst or of malignancy. Percussion yields a dull note over the tumor and a resonant note around its periphery in the flanks and epigastrium (the corona of resonance). Occasionally coils of intestines may slip in front of the tumor, but deep percussion and palpation should eliminate this possible source of error. A tympanitic note over the tumor itself may be due to intracystic gas-formation if the tumor is infected, or to intestinal gas if a fecal fistula communicates with the tumor. The palpation of the tumor determines its consistency, size, and mobility. In cystic tumors the fluctuation wave may often be elicited by tapping one side sharply with the finger-tips of one hand while those of the other are held steadily against the opposite side of the tumor. In pseudomucin cysts a lumpy, solid feel alternating with a cystic sensation can usually be made out.

In the bimanual examination the uterus is found retroverted, pushed forward against the symphysis, crowded to one side, or in a position of anteversion depressed against anterior vaginal vault The characteristic feel of a cystic growth is best appreciated with the finger-tips in the vaginal vault wherever the tumor is most prominent while counterpressure is made with the free hand over the top of the tumor.

Tapping an ovarian tumor for diagnostic purposes is no longer justifiable. It yields no information of value and subjects the patient to the dangers of intracystic hemorrhage, infection, implantation metastasis, and insures an adhesion between cyst-wall and peritoneum which complicates a subsequent operation

Treatment of Ovarian Tumors.—If papillary cysts of the broad ligament are included among the malignant growths of the ovary, which is clinically justifiable, about a quarter of all ovarian tumors are malignant.[2] The glandular cysts destroy life by an unrestrained, continuous growth. Even the least dangerous cysts, the simple serous and the parovarian, can never be expected to undergo a spontaneous cure and are liable to all the accidents of ovarian tumors Every true ovarian neoplasm, therefore, should be removed as soon as practicable after the diagnosis has been made. That the tumor is small and has given rise to no disturbance are no arguments in favor of delay. If the growth should prove malignant, it can not be removed too soon. Even if it is not, it is an advantage from every point of view to remove it before complications occur or a large size is attained. In the event of a twisted pedicle, suppuration, pressure symptoms, rupture, or intracystic bleeding there is indication for immediate operation. Rapid growth also forbids delay; it points toward malignancy, or if the tumor proves to be benign in the pathological sense, it promises a speedy destruction of the patient by pressure symptoms and exhaustion. There may be a condition of the patient's general health warranting a temporary postponement of the operation, but there are very few contraindications indeed which justify indefinite delay. Ovarian tumors have been removed repeatedly with success in early infancy and in extreme old age,[1] in pregnancy, in the midst of an attack of peritonitis, and with imperfect kidney action. The author has successfully removed a large pseudomucin glandular cyst from a woman with an aneurysm of the arch of the aorta, in process of cure, but projecting from her chest through an eroded sternum. Obviously, however, there may be positive contraindications to ovariotomy in conditions of the general health threatening to terminate the patient's life in a short time and in malignant tumors with metastases, dense adhesions, and involvement of neighboring organs, making the operation evidently a hopeless one. But even in such a case an exploratory incision is often indicated to evacuate the ascites and to determine positively that the condition is beyond radical surgical aid

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[1] I have seen this displacement three times; twice due to tight lacing, once to the fact that the tumor was elevated in pregnancy, adhered to the liver, and could not descend with the involuting womb.

[2] Pfannenstiel gives the following statistics: Schultz found 27 per cent. of ovarian tumors malignant, Leopold, 22 to 26 per cent., Freund, 21.6 per cent; Cohn, 16 per cent.; Olshausen, 15 per cent.; Hecht, 17.8 per cent, Fontane, 18.9 per cent; Kinck, 15 per cent; Pfannenstiel, 20 per cent.

Puncture of an ovarian cyst through the abdominal wall is only justifiable if there is a positive contraindication to operation or in the extremely rare cases to-day in which the tumor has reached a colossal size. In the latter case it may be considered safer to puncture the cyst some hours or days before the operation to relieve the embarrassment of heart and lungs and to avoid the danger of too sudden a reduction of intra-abdominal pressure.[2] The puncture is made with a simple trocar and canula or with an aspirating needle attached to a large bottle from which the air is exhausted The point on the abdomen to be punctured, which should be in the linea alba about half way between the symphysis and umbilicus, is as carefully cleansed as for a major operation. The trocar and canula, or aspirating needle with a caliber not less than 5 mm. ($\frac{1}{5}$ inch), are boiled The patient lies upon her back or in a semi-recumbent position; the operator, with cleansed and gloved hands, punctures the abdomen and cyst-wall deeply enough to insure the entrance of the canula well within the chief cyst cavity; an assistant exerts pressure over the top of the tumor or the upper abdomen so as to keep the cyst-wall approximated to the abdominal wall; after the evacuation of the cyst and the withdrawal of the canula the puncture wound is immediately covered with a small piece of sterile gauze which is held in place by a liberal application of collodion. If the canula drains off only a small amount of fluid, either the chief cyst cavity has not been penetrated or the cyst is divided into so many loculi that the evacuation of one or two has no effect upon its bulk. In the former case, by reinserting the needle and cautiously pushing it in different directions the main cyst cavity may be found, in the latter, nothing can be gained whatever by tapping, and the attempt should be given up. Puncture of an ovarian cyst by the vagina is not to be recommended Puncture by the rectum as was once practised is absolutely unjustifiable. The cyst rapidly refills after puncture English literature contains the records of ovarian cysts tapped every two or three weeks for some years, with the removal in the aggregate of hundreds of gallons of fluid.

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[1] Owens (London "Lancet," March 2, 1895) operated on a woman eighty-seven years old. Kelly's and Sherwood's ("Johns Hopkins Hospital Report," vol. III) statistics of over 100 operations on women past seventy years of age give a mortality of 12 per cent. The operations in infancy and early childhood give a higher mortality because such a large proportion of the tumors at this time of life are malignant.

[2] The author resorted to this measure in the largest tumor he has ever removed Forty-eight hours before the operation 6 gallons of fluid were drawn off. The tumor rapidly refilled and weighed 90 pounds when removed.

The preparation for the removal of an ovarian cyst is the same as for any abdominal section (page 600) The same instruments are required, but in addition a trocar to puncture the cyst, several broad-bladed catch-forceps with roughened internal surfaces to catch the cyst-walls, and one or two heavy volsella forceps to seize the tumor if it is solid should be added to the instrument tray.

The incision is made in the usual manner in the median line, but not extending at first too near the symphysis for fear the bladder may be higher than usual. After the peritoneum is opened the incision may be lengthened toward the symphysis after the position of the bladder is determined As soon as the abdomen is opened the color and appearance of the tumor should be observed and the finger-tip should tap the wall lightly to determine whether the contents are fluid or semi-solid. A multilocular pseudomucin cyst with a large predominant cyst-space has a cerulean or sky-blue color. A perfectly white cyst-wall indicates a dermoid, a pseudomucin cyst with jelly-like contents, or a papillary cyst. A monolocular simple serous cyst and a parovarian cyst have thin walls through which the clear serous contents show plainly. Next the operator's gloved hand is swept around the abdominal cavity between the tumor and the peritoneum to see if there are adhesions. If there are none, if the cyst is comparatively thin-walled, sky-blue in color, plainly fluctuating on palpation and large in size, it is punctured with the trocar, to which a rubber tube is attached and the contents evacuated into a bucket at the operator's feet; or, what is often quicker and more convenient, the cyst-wall is cut with a knife and the contents allowed to flow out toward the woman's thighs. Before puncturing or incising the cyst the abdominal wound should be protected with gauze pads to avoid implantation metastases. While the cyst is being evacuated pressure is exerted by an assistant over the abdomen, and as the cyst-walls become flaccid they are seized with the forceps provided for the purpose, the collapsed tumor is gradually pulled out through the wound and laid upon the sterile sheet covering the woman's symphysis. The pedicle comes plainly into view. If it is not too broad it is transfixed in the middle with a pedicle needle armed with medium-sized silk.[1] The loop of the ligature is caught by an assistant and the needle withdrawn, the loop is cut; one ligature is tied firmly around the half of the pedicle toward the operator and the ends cut off short; the other ligature is tied around the remaining half of the pedicle and the ends are doubled back again around the whole pedicle below the puncture point of the pedicle needle This method of ligating gives absolute security against hemorrhage, and if the aseptic technic is what it should be, there is nothing to be feared from the stump or ligature in the future. After tying the last ligature, two hemostats are fastened to each side of the pedicle about a quarter of an inch above the ligature, the pedicle is cut across above the hemostats, and the tumor is dropped into a vessel held ready to receive it by a nurse. The stump is then carefully inspected for bleeding; if it is dry, the hemostats are removed and the pedicle is dropped Some operators prefer to sew the peritoneum over raw surface of the stump, others cut the pedicle with a cautery knife, and it has been proposed to sew the stump to the anterior abdominal wall to correct a tendency to retroversion of the uterus and to avoid adhesions between the stump and intestines. After the removal of the tumor, the toilet of the peritoneum is carefully made. Whether a trocar or a knife has been used to puncture the cyst, some cyst-contents often escape into the peritoneal cavity. They should be carefully removed. The other ovary is lifted out of the abdominal cavity and closely inspected. If it is not diseased it is not removed unless the ovarian tumor is malignant or papillary. The pads used to protect the abdominal wound and to cleanse the abdominal cavity are removed and counted. A count is made of all the pads prepared for the operation;[1] all of them being accounted for, the abdomen is closed in the usual manner (page 630). If the tumor is of moderate size, if it is divided into loculi so numerous that the evacuation of a few has no perceptible influence on its bulk, if there is inflammation or suppuration, if there is any suspicion that the cyst is a dermoid or papillary, it should not be punctured during the operation, but should be removed whole no matter how large an incision is required. It is better to have a long abdominal wound than to lose the patient later from implantation metastases or to contaminate the peritoneal cavity with putrescible or infected contents that may be difficult or impossible to remove

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[1] The author, after a prolonged trial of silk and catgut, prefers silk in all clean, aseptic cases It can be tied more firmly and the knot will not slip nor the ligature loosen. Every one who uses catgut exclusively will occasionally have to deplore a death from secondary hemorrhage.

Adhesions between the cyst-wall, the peritoneum of the anterior abdominal wall, the pelvic peritoneum, the omentum, the intestines, the mesentery, the liver, spleen, and kidneys may require special attention

The adhesions between the cyst-wall and the anterior abdominal wall are commonly broken up with ease by sweeping the hand around between the tumor and the abdominal wall. As successive portions of the tumor after its evacuation are pulled out of the wound, adhesions not at first accessible are easily reached and are severed in the same way. Care must be exercised not to mistake the peritoneum for the cyst-wall and not to strip it off from the fascia. If the peritoneum, owing to dense and widespread agglutination with the cyst-wall, can not be lifted away from the latter and incised separately, the abdominal incision is lengthened until a place is reached where the adhesions cease or the cyst-wall is incised, the tumor evacuated, and a careful study is made of the different layers to detect the true area of cleavage between the peritoneum and the cyst-wall. The adhesions may take the form of thick bands or isolated areas of agglutination, too strong to be easily and safely torn across. This is often the case if the tumor has been tapped.[2] Such adhesions must often be cut. The quickest and safest way is to clamp each one with a hemostat and to cut the adhesion between the instrument and the tumor-wall. The hemostats are counted as they are clamped; the original number provided for the operation should also always be known; the hemostats are recounted as they are removed, and a count is made of the total number in the instrument tray before the abdomen is closed. After the removal of the tumor a ligature of fine silk or catgut is tied under each hemostat before it is removed. If the areas of adhesion are too broad to be treated in this manner and an oozing surface remains after severing the adhesions, the bleeding may be checked by pressure with gauze pads, the application of very hot water, mattress or purse-string sutures surrounding the bleeding areas, approximating the bleeding surface to the opposite abdominal wall, or transfixing the abdominal wall. Ligation of the epigastric artery has been effectual. The application of turpentine, Monsel's solution, and the actual cautery have also been successful, but these agents are inferior to the methods previously described.

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[1] The author uses an invariable number, fifteen, for every abdominal section.

[2] The author once removed a cyst that had been tapped twenty times, each puncture resulting in a strong adhesion that had to be cut Such cases are not often seen to day.

Adhesions between the tumor and the pelvic peritoneum may be very firm They are broken up as in operations for pyosalpinx, by finding the area of cleavage, inserting the finger-tips, and by a to-and-fro movement separating the united structures. Rupture by traction or the use of cutting instruments may be required. Hemorrhage must be controlled cautiously, as the careless use of needles and ligatures may occlude the ureter or wound a large vessel.

Omental adhesions are easily dealt with. They may be broken, or if they contain large blood-vessels, as is not infrequently the case, should be ligated and cut.

Intestinal adhesions are usually thin sheets of false membrane readily broken, but the connection may be so intimate between tumor and bowel that the outer layers of the tumor-wall must be left upon the intestinal coat to avoid injury to the latter Raw spaces on the intestines should be covered with peritoneum by mattress or Lembert sutures

In separating adhesions to the mesentery care must be exercised not to ligate important blood-vessels, which might result in gangrene of the intestinal loop which they nourished.

Adhesions to the abdominal viscera must be separated with great care, especially in the case of the under surface of the liver, so that lacerations and consequent hemorrhages may be avoided. Nothing is more embarrassing than the bleeding from a torn liver. The actual cautery may stop it or it may be controlled by gauze packing.[1]

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[1] In a case of the author's no other means would control the bleeding. The space between the stomach and liver was firmly packed with a long strip of gauze, the end of which protruded from the upper angle of the abdominal wound. It was removed in twenty-four hours. The patient made a perfect recovery.

In cases of *twisted pedicle* the tumor is turned on its longitudinal axis until the torsion disappears, before the pedicle is ligated or the tumor is removed. If there is extensive thrombosis of the veins of the stump a mass ligature should be avoided. The vessels are tied separately. The tumor, which is often almost black in color and contains effused blood in a highly putrescible condition, if not actually infected, should be removed unopened.

Intraligamentary tumors must usually be dealt with by enucleation. A double ligature is applied to the ovarian artery, to the lateral side of the tumor, including the suspensory ligament of the ovary in the small strip of broad ligament running free between the tumor and the pelvic wall. An incision is then made in the free border of the broad ligament between the ligatures. The tumor-wall is thus exposed, and enucleation by inserting the finger-tips between the broad ligament and the tumor-wall is usually easy, the incision in the broad ligament being enlarged on its anterior face and the tumor being rolled out toward the pelvic wall or toward the median line, as is most easy and practicable in the individual case. The blood-vessels thus ruptured are small and the bleeding usually insignificant. If there is active oozing at the base of the cavity left after the enucleation of the tumor, ligatures, if used at all, must be applied with the greatest caution on account of a possible occlusion of the ureter. It is usually easier to enucleate an intraligamentary tumor if it is unruptured Thin-walled cysts may easily be perforated or ruptured by the manipulation of the operator. In such a case the tumor-wall is seized by catch-forceps and the cyst-wall is then stripped off from its connection with the inner surface of the broad ligament, successive portions of it being held taut by an assistant while the operator frees it from its attachments.

In bilateral intraligamentary tumors the procedure is the same on each side A uterine tumor is not infrequently associated with double intraligamentary growths, in which case a hysterectomy is added to the bilateral enucleation. Hysterectomy is indicated if the broad ligament growths are malignant, and it may possibly be required also to more certainly control hemorrhage, even if the uterus itself is healthy. A puzzling problem after the removal of an intraligamentary tumor is what to do with the raw cavity, often of great size, from which it was enucleated. If there is no oozing to speak of it may be sufficient to sew the flaps of broad ligament over it and thus shut it off from the peritoneal cavity, or simply to leave the raw surface exposed, cutting away redundant portions of the broad ligament; but the author has found it safer and more satisfactory, in the majority of cases, if the tumor is large, to perforate the vaginal vault with a sharp-pointed scissors as close to the cervix as possible and a little posterior to it, to pack the cavity with a strip of sterile gauze, pushing the end out into the vagina, and to sew the flaps of broad ligament over the gauze with catgut, thus excluding it from the peritoneal cavity. It is often advisable to cut away redundant portions of the broad ligament before sewing the flaps. The gauze is removed by the vagina at the end of forty-eight hours and is replaced by a T-shaped rubber drainage tube through which the cavity is irrigated daily after the third day with sterile water until all discharge ceases and the former bed of the tumor is obliterated. It requires, as a rule, ten days to secure this result.

If the tumor is adherent to the broad ligament or to the pelvic fascia on its base, as may be the case in papillary and malignant growths, it may be impossible to enucleate it entire. Portions are left behind in the depth of the tumor bed. It is often impracticable to remove these fragments completely. In such a case an effort should be made to destroy them by the actual cautery. The growth of a subserous tumor between the layers of the mesocolon may be a most embarrassing complication. Care must be exercised not to ligate the mesenteric vessels too extensively for fear of gangrene of the bowel. An excision of a portion of the intestine and an end-to-end anastomosis may be required.

Suppurating and infected ovarian tumors must be removed, if possible, without rupturing them. Should they rupture and discharge any part of their contents into the abdominal cavity, the toilet of the peritoneum must be carefully made by removing every particle of discharge with dry gauze pads. All the ligature material must be of catgut and the abdomen should be drained. It is occasionally wiser, on account of the patient's condition, not to attempt the removal of a suppurating cyst, but to rest content with sewing it to the abdominal wall, evacuating its contents and draining the sac. Later, if necessary, the cyst-wall may be removed, but nothing more may be required, the cyst-cavity being obliterated and the cyst-wall shriveling into a small mass that causes no symptoms

Rupture of the cyst into the abdominal cavity usually indicates an abdominal section and the careful removal of the cyst-contents from Douglas's pouch, the region of the kidneys, and wherever else they may be found. It is particularly important to remove with pads and the hands all of the gelatinous material from a pseudomucin cyst, else implantation metastasis may develop. It may be difficult or impossible to remove the material from a dermoid cyst if the rupture has occurred many hours before the operation. It becomes embedded in plastic exudate and can not be wiped or washed away. Fresh cyst-contents from a dermoid are not infectious, dirty as they may appear, but they are putrescible, and after exposure to the atmosphere, if not removed from the abdomen, may cause septic peritonitis. Drainage is of no avail if the cyst-contents are widely distributed over the whole abdominal cavity. The abdomen must be closed, taking the chance of the decomposition of the material left within it. If the cyst has ruptured into the bowel or bladder, the tumor must be treated as an infected one: After its removal the opening into the bowel or bladder should be closed by sutures if the edges are healthy enough or can be made sufficiently so by trimming to give reasonable assurance that they will hold. Otherwise the opening is allowed to gape, drainage of the pelvis and abdomen being naturally required (page 633). In any event, whether sutures are used or not, drainage is usually necessary.

In *malignant tumors, papillary cysts, and implantation metastases of proliferating adenomata* one may be confronted with the problem of dealing with extensions of the growth beyond the ovary. The common-sense rule should be followed to remove all of the growth possible unless the operation promised to be too formidable for the results that might be secured. Thus, in papillary growths a complete cure may be effected by removing papillomata from the surface of the uterus, the broad ligaments, and neighboring structures, in addition to the removal of the ovaries. In pseudomyxoma peritonei, also, it may be possible to secure a permanent good result by the removal of all or of a great portion of the growth, and at any rate an amelioration of the condition for a long time. With true malignant tumors the case is different. If the sarcoma or carcinoma has spread much beyond the ovary it is doubtful if any good is even temporarily secured by the removal of a part of the growth. Recurrence is certain, and an immediate death is only too likely to cast unnecessary discredit upon the operator, as the subjects of malignant abdominal growths do not stand operations well. The evacuation of the ascites and the removal, perhaps, of well-pedunculated masses are all, as a rule, that should be attempted.

The treatment of the other ovary and of the uterus in cases of ovarian tumors is an important question on which the operator should have a definite and well-advised opinion. In a woman of child-bearing age, the other ovary, if healthy, should not be disturbed, except in cases of sarcoma, carcinoma, endothelioma, and papilloma of the ovary. Even if one ovary in these cases appears healthy, clinical experience teaches that it will probably develop a malignant growth in the near future, and it should be removed. In true malignant disease of one or both ovaries the uterus should also be removed. Recurrence, metastasis, or extension of the growth in a uterus left behind has been observed.

If an ovarian tumor of any kind is removed from a woman near the menopause or past the age when child-bearing is likely, it is more prudent to remove both ovaries. Proliferating cysts and dermoids are not uncommonly bilateral or affect first one ovary and then the other. The chance of a second operation in young women contemplating matrimony or desirous of bearing children must be taken. In older patients it is unnecessary to run the risk. In the former class of women with benign new-growths in both ovaries, fertility has been preserved by the complete removal of an ovarian tumor on one side and the exsection of a smaller growth from the other ovary, leaving healthy ovarian structure.[1]

Foreign bodies in the ovary have been reported by Haveland and Liebmann,[2] who found respectively a sewing needle and a darning needle in the ovary.

Echinococcus cysts of the ovary have been reported in connection with these parasitic growths in the abdomen and pelvis. A primary infection of the ovary has been observed by Péan, but is exceedingly rare.

Implantation and Transplantation of the Ovaries.—It has been demonstrated by experiments upon animals and by clinical observations in women that ovaries may be implanted from another individual or may be transplanted to an abnormal situation, with continued nutrition, physiological activity, and consequent impregnation The utilization of this possibility in gynecology opens up an interesting field. The disagreeable consequences of castration might possibly be avoided by ovarian implantation, sewing a freshly removed ovary, kept in warm normal salt solution and sewed by catgut or fine silk to the peritoneum of the broad ligament, in Douglas's pouch or in the vesico-uterine reduplication of the peritoneum. A short incision is made in the peritoneum and the hilus of the ovary is implanted in raw surface, the edges of the peritoneum being brought about half-way up the free ovarian surface. Sterility following castration, atrophy, or congenital defects of the ovary might possibly be cured in this way.

Impregnation has followed the transplantation of the ovary into the lumen of the tube or in a uterine cornu. The infundibulopelvic ligament is cut to increase the mobility of the ovary, but its attachments at the hilus are undisturbed.[1]

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[1] Of 6 such operations, conception occurred afterward in 5. Pfannenstiel, "Handbuch der Gyn.," vol iii, p. 488.

[2] "Medical Record," 1892, Oct. 1, and "Centralbl. f Gyn.," 1897, p. 421.

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[1] Katsch, "La Gynecol.," Aug., 1901; Dudley, "Jour. Amer. Med. Assoc.," Aug. 10, 1901; Monprofit, "Centralbl. f. Gyn.," 1901, p. 984; Halban, "Verh. d. deutschen Ges f. Gyn.," 1901, p. 619; Amilo-Roxas, "Archivio di Ostetr e Ginec.," vol. viii, Nos. 5, 6; Pfeiffer, Diss. Inaug, Tübingen, 1901; Nicholson, "A Review of the Literature of Ovarian Transportation," "Univ. of Penna. Med. Bulletin," 1902.

PART X.

DISEASES OF THE PELVIC CONNECTIVE TISSUE AND OF THE PERITONEUM.

The pelvic connective tissue may be divided into—

1. The loose, cellular tissue acting as pads or cushions filling the pelvic spaces and interposed between the pelvic viscera to permit their mobility.

2. The connective-tissue investiture of the pelvic viscera under the serosa, the parametrium, paracolpium, paracystium, paraproctium, analogous to the subcutaneous connective tissue, but sending out extensions in ligamentous form reinforced by muscular tissue, as the cardinal ligaments of the uterus, in the bases of the broad ligaments supporting the cervix and vaginal vaults, the uterosacral ligaments, from the parametrium around the lateral aspects of the cervix to the paraproctium, the utero-vesical ligaments from the parametrium to the retrosymphyseal connective tissue.

3. The connective-tissue sheaths of the blood-vessels, lymphatics, and nerves, developed in the bases of the broad ligaments into strong ligamentous structures supporting the cervix and vaginal vaults and regarded as the main factor in maintaining the normal uterine position

4. Membranous extensions, the pelvic fascia, uniting the connective tissue envelopes of the pelvic organs with the pelvic walls, fixing them and all the pelvic contents in their normal position. The pelvic fascia is divided into two main sheets—(1) the parietal, lining the lateral pelvic walls and covering the upper aspect of the pelvic diaphragm, and (2) the perineal, covering the perineal muscles and entering into the composition of the perineal center or body. The connective-tissue sheaths of the pelvic muscles are offshoots of these two main divisions, giving to the pelvic fascia as a whole its complex formation. In addition to the two main horizontal layers of the pelvic fascia there are, according to v. Rosthorn, three perpendicular divisions running across the pelvis transversely dividing imperfectly the vesical, uterine, and rectal spaces.

In addition to this easily recognizable anatomical arrangement of the pelvic fascia and connective tissue there are finer subdivisions which do not appear upon dissection, but which are demonstrable by injection experiments. Thus, if fluid is injected between the peritoneal layers into the upper part of the broad ligament, the mesosalpinx, the upper portion of the broad ligament is distended, the fluid appears in the iliac fossa and spreads downward toward Poupart's ligament and upward into the mesocolon. Injections under the anterior peritoneal covering of the base of the broad ligament result in an infiltration of the paracystium, the connective tissue between the cervix uteri and bladder, the round ligament and the groin. Injections under the posterior peritoneal covering of the base of the broad ligament result in an infiltration of the posterior portion of the broad ligament alone, the iliac fossa, the mesocolon, or the region of Poupart's ligament. The anterior division of the pelvis is not affected. Injections into the connective tissue of the lateral vaginal vault alongside the vaginal portion of the cervix result in infiltration of the connective tissue under the mucous membrane of the vaginal vault, the paravesical and precervical spaces, and later of the base of the broad ligament Injections into the anterior vaginal vault cause infiltration of the precervical and paravesical connective tissue, into the posterior vaginal vault infiltration of the retrocervical connective tissue, and extending downward, of the connective tissue between the vagina and rectum and to either side of the latter

These experiments explain in part the extensions in various directions of a pelvic abscess.

The pelvic connective tissue is in direct communication by continuity with that of the external surfaces of the body by extensions along the vessels and canals that leave the pelvis and with the subperitoneal connective tissue of the upper abdomen mainly along the great blood-vessels and lymphatics, the mesocecum and colon, and the intra-abdominal subperitoneal fascia.

The arrangement of the pelvic peritoneum is too well understood to require extended description. Covering all the pelvic viscera and structures except the ovaries, it is thrown into folds, elevations, and depressions by the form of the pelvic organs under it, the spaces between them, and the ligaments supporting or connecting them.

The most essential anatomical features for the student of gynecology to remember are the shallow uterovesical pouch or reduplication; the deeper uterorectal pouch or the pouch of Douglas, with the uterosacral ligaments on either side of its upper boundaries, the elevation of the peritoneum over the bladder and its union with the internal surface of the anterior abdominal wall at such a level that a considerable space is left above the symphysis, in which an incision may be made without opening the peritoneal cavity. The greater the distention of the bladder, the higher is the level of peritoneal attachment to the anterior abdominal wall.

Inflammation of the Pelvic Connective Tissue.—Pelvic cellulitis, or parametritis, is of puerperal origin in more than two-thirds of the cases. It is always due to an infection. Aside from the child-bearing process, the introduction of foreign bodies into the vagina, such as pessaries, syringe nozzles, sponges to prevent conception; rough and unskilful digital examinations; operations upon and explorations of the cervix and uterine cavity; the mixed infection of a gonorrhea in which streptococci and staphylococci follow the gonococci; micro-organisms settled in the pelvic connective tissue from the bowel, the bladder, and the blood; suppuration of intraligamentary tumors, and extension of an infectious inflammation from the tubes and the ovaries are causes of pelvic cellulitis. Inflammations of apparently spontaneous or primary character, as for example in young girls with an intact hymen catching cold during menstruation, without demonstrable source of infection, are explained by a lessened resisting power in the pelvic connective tissue and an immigration of micro-organisms from the lymphatics, the blood-current, or possibly from the bowel. The pathological anatomy and terminations are the same as in the inflammation of puerperal origin—edema, exudate, resolution, suppuration, or eventually a chronic cirrhosis and thickening of the pelvic connective tissue. The situation of the inflammation is in one of the divisions of the pelvic connective tissue, between the layers of the broad ligament, in the parametrium, the paracystium, or paraproctium The probable course of suppuration in these localities has already been indicated in the description of injection experiments in the pelvic connective tissue. If suppuration occurs and the abscess is not evacuated by an early incision, spontaneous rupture is likely into the vaginal vault, the pelvic viscera, the rectum, through the abdominal wall over Poupart's ligament or above the symphysis and possibly through the sciatic foramen in the gluteal region, through the ischiorectal fossa in the perineal region alongside the anus, through the obturator foramen on the inner side of the thigh, through the crural canal on the anterior surface of the thigh, and, rarest of all, backward, past the outer edge of the quadratus lumborum through the skin of the back.

As in the puerperium, pelvic cellulitis is very frequently associated with pelvic peritonitis.

The **symptoms** are general and local. The former are those of infections in general—fever, rapid pulse, prostration, possibly chills and pyemic manifestations. The latter are intense pain and sensitiveness at first, quite rapidly subsiding if resolution occurs, and often diminishing even though suppuration follows. There is irritability of the bladder or bowel if the inflammation involves the paracystium or paraproctium. On a digital examination there is at first a boggy feel of the affected edematous area, followed by the stone-like hardness of a cellulitic exudate or the doughy feel of suppuration. The situation and extension of the infiltration may make the diagnosis plain and may enable one to decide definitely that he is dealing with a pelvic cellulitis alone and not with a pelvic peritonitis or a combination of the two. Thus, in a retrocervical cellulitis the inflammation extends downward between the vagina and rectum far below the lowest possible level of Douglas's pouch, pushing the posterior vaginal wall forward and practically obliterating the posterior fornix. In an inflammation of the paracystium a mass is felt above the symphysis, shading off laterally, without the well-defined lateral borders of an intrapelvic tumor. By the vagina the exudate is not so plainly appreciable; the lateral and posterior vaginal fornices are normal to the sense of touch. In a parametritis extending along the base of the broad ligament, the mass is continuous with the cervix on the affected side, extends to the pelvic wall, and is felt above Poupart's ligament as a hard, infiltrated area extending within the anterior superior spine of the ilium to the iliac fossa. Douglas's pouch is free, though the infiltrated connective tissue may be felt embracing the posterior surface of the cervix. It is often impossible, however, to make a positive differential diagnosis between pelvic cellulitis and pelvic peritonitis without an exploratory abdominal section. The elaborate tables in many text-books drawing sharply defined lines between the two are misleading. In case of doubt an abdominal section is indicated. If the suppuration is entirely extraperitoneal, the abdomen is closed and the abscess is opened in the most appropriate place—usually above Poupart's ligament, often through the vaginal vault, or in both places, to allow a through-and-through drainage.

Treatment.—Retrocervical inflammation and suppuration are treated by an incision in the posterior vaginal wall; suppurative inflammation of the paracystium, by an incision above the symphysis. Counterdrainage through the anterior vaginal vault is contraindicated for fear of injuring the bladder. If the case is seen late and the abscess is pointing in one of the unusual situations already noted (the thigh, the perineum, and the back), the incision may be made there. Prolonged drainage of the abscess cavity by a rubber tube and daily irrigation are usually necessary. Pelvic cellulitis of non-puerperal origin is more likely to end in resolution than is puerperal inflammation. Time should be allowed, therefore, for a spontaneous cure. Rest in bed, ice-bags or the ice-water coil over the groin or hypogastrium, hot vaginal douches twice daily, a soft diet and laxatives are ordered. A persistence of fever and of the local symptoms of inflammation for more than a week ordinarily indicates operative interference. If the acute symptoms subside, the exudate organizes and is not absorbed, there is fixation of the pelvic organs, pain on movement, jolt, or jar, irritability of the bladder, irritation or partial obstruction of the rectum, chronic congestion of the pelvic viscera, and disturbances of menstruation. The pelvic exudate is felt on a combined examination, most often in the parametrium, next most frequently in the retrocervical tissues, but possibly in any of the divisions of the pelvic connective tissue.

The treatment of organized cellulitic exudate is boroglycerid tampons in the vagina; the application of heat to the whole pelvic region by sitz-baths or special apparatuses like the heat chambers for inflamed and rheumatic joints;[1] pressure by bags of shot or mercury on the hypogastrium, and a distended colpeurynter in the vagina or rectum; abdominal massage and Swedish exercise. Surgical intervention is occasionally required to sever bands of organized exudate or the thickened sacro-uterine ligaments.

By **chronic cellulitis** is understood a condition not necessarily related to the infectious acute cellulitis just described. There may be no history of fever, acute pain, or of infection. It is rather a chronic congestion than an inflammation, and in its earlier stages is always associated with chronic metritis and endometritis. In short, it is but part of a general pelvic congestion, and scarcely deserves the distinctive name of an entity among the pelvic diseases. It usually follows childbirth, but is only demonstrable some weeks or months afterward. It may be due to any of the causes of chronic pelvic congestion. It has therefore the same causes as a chronic metritis and endometritis. There are the usual pathological changes of chronically congested connective tissue—hyperemia, overgrowth, and an ultimate shrinkage. The hyperemic stage is not demonstrable except in the associated hyperemia of the uterus, the endometrium, and the uterine adnexa. In the stage of overgrowth the pelvic connective tissue is thickened and becomes inelastic. These physical conditions are most marked, as might be expected, where the pelvic connective tissue is originally thickest and best developed—namely, in the utero-sacral ligaments and in the bases of the broad ligament (the cardinal ligaments of the uterus). The result is a certain amount of fixation and possibly some displacement of the uterus. For example, thick and inelastic uterosacral ligaments are often found with anteflexion of the uterus. The thickened and stiffened ligaments are sensitive. Hence movements of the pelvic viscera, coitus, defecation, walking, jolts or jars of any kind may be painful. Many local symptoms and reflex neuroses are ascribed to chronic cellulitis, but they are expressions of the general pelvic congestion and are referable rather to the metritis and endometritis than to the cellulitis. On digital examination the thickened bands of connective tissue are plainly felt, occupying the situation and following the course of the cardinal uterine ligaments and of the uterosacral ligaments. Sweeping the finger-tip across them causes acute pain. It is easy to mistake bands of peritoneal adhesions for the thickened ligaments, but a rectal as well as a vaginal examination should enable one to differentiate between the two.

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[1] Polano, "Centralbl. f. Gyn.," 1901, No. 30.

The treatment of this form of cellulitis is the removal of all causes of pelvic congestion, the repair of injuries, curettage, and for the hyperplasia of the connective tissue itself, a prolonged course of glycerin and ichthyol lamb's-wool tampons renewed every other day and packed tightly enough to exert considerable pressure, with an application of iodin to the vaginal vault about once a week. Abdominal massage and the Swedish movements designed to exercise the pelvic muscles and ligaments are most helpful, in addition to the local treatment. Of all pelvic conditions, chronic cellulitis ought to be, and no doubt is, the one most benefited by the Thure Brandt system of pelvic massage by intravaginal manipulations, but the method is so objectionable that the author has never favored it as a treatment to be carried out by the physician.[1]

The ultimate stage of chronic cellulitis is shrinkage of the indurated pelvic connective tissue, strangulation of the blood- and nerve-supply which passes through it to the genital organs, and a consequent atrophy, with diminution in the size of the uterus, amenorrhea, precocious menopause, and contraction of the vagina Hence this form of cellulitis is called the atrophic. If far advanced it is incurable.

Injuries of the pelvic connective tissue, aside from the child-bearing process, have the same causes as injuries of the vagina and uterus (pp. 145, 314), with which they are almost always associated, though it is conceivable that without demonstrable injury of the vaginal mucous membrane or skin of the vulva a trauma might be transmitted to the subjacent connective tissue. The possible results are hemorrhage, infection, and scar-tissue development. Frank hemorrhage is managed on general surgical principles by pressure with a tampon or the ligation of bleeding vessels. Interstitial hemorrhage or *pelvic hematoma*[1] deserves special consideration. Intraperitoneal and extraperitoneal pelvic hemorrhages were first differentiated by Huguier (1851). The latter are comparatively rare, occurring not one-tenth as often as the former. The situation of the effusion is either above or below the pelvic diaphragm. The latter cases are considered in connection with the diseases of the vagina and vulva. The interstitial hemorrhages above the pelvic diaphragm and below the peritoneum may occupy one of three situations: (1) precervical, from rupture of the veins in the plexus at the base of the bladder; (2) para-uterine, from the vessels of the broad ligament, either those at its base, the utero-vaginal plexus, or those in the upper portion, the pampiniform plexus; (3) retrocervical or retrovaginal, from the hemorrhoidal plexus. There may be an extension of the effusion from one locality to another; thus, a hematoma in one broad ligament has extended around the cervix to the other broad ligament. There is a tendency for the extravasation to follow the course of injections into the pelvic connective tissue aready described.

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[1] For some time I referred patients to a masseuse who had taken a course in Copenhagen and was well versed in the system, but the results were not satisfactory.

Pelvic hematoma is usually associated with child-bearing; it may have its origin in tubal or broad ligament gestation. Aside from the child-bearing process, the cause may be found in traumatism, strains, acute congestion, diseases of the blood-vessels, as in nephritis and syphilis, and in varices of the pelvic veins, most often in those of the pampiniform plexus.[2] Except in association with child-bearing the accident is usually one of middle or advanced age.

The diagnosis of interstitial pelvic hemorrhage should not be very difficult: Following one of the causes enumerated, a sudden violent pelvic pain, associated with the symptoms of internal bleeding if the hemorrhage is not soon checked by the anatomical limitations of the effusion; the appearance of a tumor limited to the pelvic connective tissue in one of the three situations described; a displacement of the uterus away from the hematoma, the intimate association of the mass with the uterine body or cervix; the gradual change in the consistency of the tumor, as the blood clots, and the absence of fever or other signs of inflammation should indicate with sufficient distinctness the nature of the accident. The greatest difficulty in the diagnosis of a pelvic hematoma is its differentiation from a pelvic hematocele. The difficulty is increased by the fact that the two may be associated. The following symptoms are useful in the differential diagnosis: The effusion is limited to certain areas and in amount in pelvic hematoma; not at first necessarily so in pelvic hematocele; there is an absence of peritonitic symptoms in hematoma; they are present in hematocele. The direction of the effusion is downward in hematoma, upward in hematocele. In hematoma there is a tendency to recurrence of the hemorrhage, and successive increments in the size of the tumor, which is not the case in hematocele. The tumor slowly reaches its maximum size in hematoma, quickly in hematocele. A hematocele almost always occupies in part at least Douglas's pouch, without extending downward behind the posterior vaginal wall; a retrocervical hematoma burrows downward between the vagina and the rectum. Hematoma in the vast majority of cases is completely absorbed and leaves no trace behind it; hematocele is always followed by peritoneal adhesions even if the blood is completely absorbed. The absorption of the blood is accomplished slowly in hematoma, much more quickly in hematocele.

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[1] In common with the majority of writers, the author uses the words *hematoma* for interstitial pelvic hemorrhage and *hematocele* for intraperitoneal hemorrhage

[2] The author had charge of a case in the Philadelphia Hospital: An elderly woman, while walking across a court-yard, fell to the ground and became unconscious On examination, signs of internal hemorrhage were manifest, and a pelvic examination revealed free fluid in the abdomen An immediate section demonstrated a rupture of the pampiniform plexus, a pelvic hematoma, rupture of the posterior leaf of the broad ligament, and intraperitoneal bleeding. The woman recovered.

The *terminations* of a hematoma are: absorption, which almost always occurs; rupture into the peritoneal cavity, the vagina, or rectum; and suppuration.

The *treatment* should usually be abstention from all active interference,[1] rest in bed, application of cold over the site of the effusion until there is no further increase in the size of the tumor, and opium to allay the pain and to promote perfect rest. Later, means to favor absorption may be recommended; vaginal douches, iodin over the groins or to the vaginal vaults; cautious abdominal massage, and the faradic electric current. Weeks and months may be required for the complete absorption of a hematoma. If the tumor is very large, if a spontaneous rupture is feared, if there are signs of infection and inflammation, operative interference is indicated Precervical and retrocervical effusions are best opened through the vaginal vaults. The cavity is carefully cleansed of all blood-clots, is irrigated and drained from day to day, until it is gradually obliterated. Cases of parametritic hematoma between the layers of the broad ligament may be treated in the same way, but not infrequently the vaginal incision is found inadequate. Deaths have occurred from decomposing blood-clots left behind after a colpotomy Abdominal section or an extraperitoneal incision above Poupart's ligament gives better access to the tumor cavity. In an abdominal section it may be possible to incise the vaginal vault from above for the purpose of drainage after the tumor cavity has been thoroughly emptied of all liquid and clotted blood, finally sewing the layers of the broad ligament together again over the site of the hematoma In an inguinal section it is often an advantage to establish through-and-through drainage by a rubber tube inserted in the opening over Poupart's ligament and led out through a puncture in the vaginal vault as close to the cervix as possible.

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[1] Thorn, in 34 cases, found operative interference necessary only once; "Wien. med Wochenschr.," No. 10, 1895

Neoplasms of the Pelvic Connective Tissue.—Fibromyomata, springing usually from the ovarian or the round ligaments, are the commonest growths of the pelvic connective tissue, but they are comparatively rare. Sanger, in 1883, collected 11 cases of fibromyomata of the broad ligament, 12 of the round ligament; Kreckels, in 1896, collected 45 such tumors; and v Rosthorn, 51.[1] It is certain that the growth does not spring from the uterus or ovary only if it can be clearly demonstrated that no connection exists between the tumor and these organs except the normal anatomical structures Thus, a fibromyoma of the ovarian ligament should be connected with both the ovary and the uterus by an extension of the ligament from the tumor and by the broad ligament investiture common to all three, but there should be no new-formed pedicle, and both ovary and uterus should be distinct from the tumor (Fig. 442) Tumors of the round ligament are most likely to be pedunculated Those of the ovarian ligament may be also Connective-tissue growths originating in the base of the broad ligament remain intraligamentary. The symptoms, the clinical history, and the degenerations of these growths are the same as those of intraligamentary uterine fibroids.

The differential diagnosis of fibroids of the pelvic connective tissue from uterine and ovarian tumors is practically impossible until the abdomen is opened. If they grow from the base of the broad ligament, they are naturally taken for cervical intraligamentary myomata, if from the upper portion of the broad ligament, for tumors of ovarian origin or for subperitoneal fibroids of the uterus. Fibromyomata of the round ligament originating in the pelvis and extending into the inguinal canal would alone present distinctive features by the peculiarity of their course of growth and their situation.

If the tumor has reached a considerable size, if it causes pressure symptoms, if the rate of growth becomes suddenly rapid instead of being extremely slow, which is the rule, operative interference is indicated. The removal of a pedunculated tumor presents no difficulty, ligation of the pedicle and excision are alone necessary. Intraligamentary growths are removed in the same way as intraligamentary fibroids of the uterus, intraligamentary tumors of the ovary, and parovarian cysts. The ovarian artery is ligated in two places, the free edge of the broad ligament is cut between the ligatures, or an incision

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[1] "Handbuch der Gyn.," vol. iii, 2, p. 157.

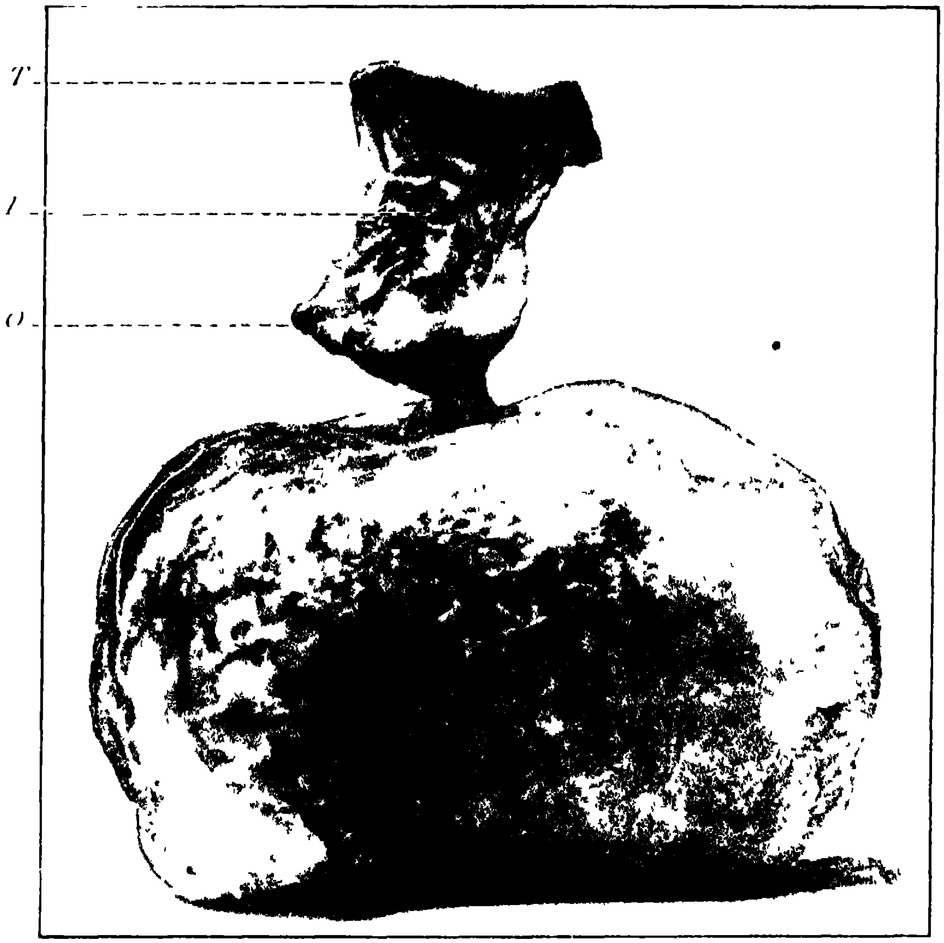

Fig 442 —Myoma of the ovarian ligament *T*, Tube; *O*, ovary; *L*, broad ligament

is made over the anterior face of the broad ligament, the capsule of the tumor is incised, and it is peeled out of its bed, often with surprising ease. If the tumor has grown upward into the mesocolon on either side, the control of hemorrhage is difficult and numerous vessels must be ligated; if downward, the ureter is endangered, in its removal; the precautions necessary to avoid such an accident, and the treatment of the bed of the enucleated tumor, have already been described.

Other tumors having their origin in the pelvic connective tissue are sarcomata, carcinomata, lipomata,[1] and dermoids. In 16 reported cases of the last named, the greater number (5) were situated between the rectum and the sacrum. They have the same structure and peculiarities as dermoids in other portions of the body, and do not display the complicated embryonal development seen in the so-called dermoids or ovulogenous tumors of the ovary unless they are derived from an accessory ovary.[2]

Sänger's proposition to remove dermoids as well as other tumors of the pelvic connective tissue by *perineal section* is worthy of a more extended trial. The operation is most appropriate for the removal of tumors situated low within the subperitoneal pelvic cavity.

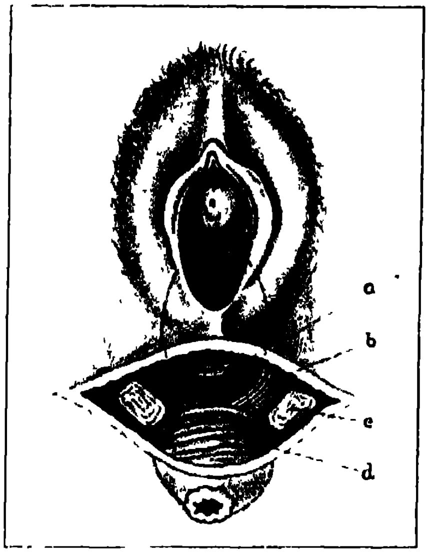

Fig 443.—Transverse perineotomy: *a*, Vagina, *b*, levator ani muscle; *c*, ischiorectal fossa; *d*, rectum (Zuckerkandl).

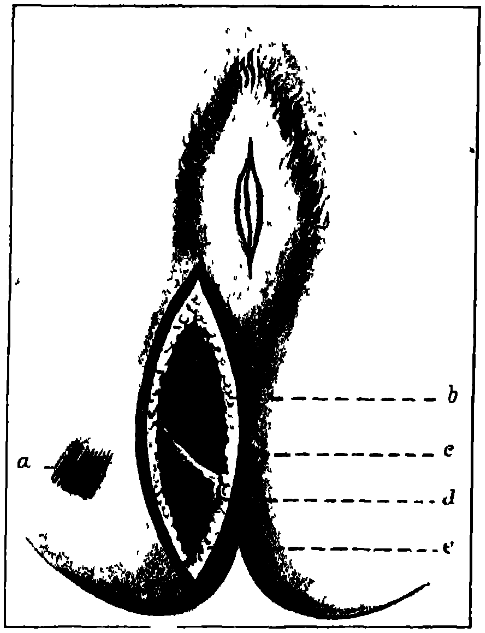

Fig. 444.—Sagittal perineotomy. *a*, Tuber ischii; *b*, levator ani muscle and pelvic fascia, *c*, anus; *d*, ischiorectal fossa, *e*, gluteus maximus muscle (Hegar-Sänger).

Carcinomata in the parametrium, if they are primary, originate in the remnants of the Wolffian body.[3] They may be secondary or metastatic.

Echinococcus cysts of the pelvic connective tissue are very rarely observed in America.[4] In other parts of the world, notably in certain districts of Germany (Breslau, Mecklenburg), they are more common. The retrocervical connective tissue and the paraproctium are the favorite seats of the parasitic growths. The tumor varies in size from that of an orange to that of a cocoanut. The rate of growth is extremely slow. The diagnosis is made before operation by the passage of cyst membranes, hooklets, and even of entire cysts spontaneously from the rectum, bladder, or vagina, through ulcerative perforations, or by obtaining the same structures through an exploratory puncture or incision.

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[1] Sänger collected 7 cases of lipomata; von Rosthorn, 4 of sarcomata (*op. cit.*, p. 168).

[2] Seitz reports a number of such cases ("Volkmann's klin. Vortr.," No. 286).

[3] Heinsius, "Carcinombildung im Beckenbindegewebe," "Zeitschr. f. Geb. u. Gyn.," Bd. xlv, H. 2

[4] The author has seen one case in fifteen years.

The treatment is the removal of the entire cystic mass by vaginal section, if possible. If the abdomen is opened, it may be possible to enucleate the entire mass as in the case of intraligamentary tumors; but for fear of implantation metastases it is safer to sew the main cyst-wall to the abdominal wall, to evacuate its interior as well as possible and to establish through-and-through drainage by puncturing the vaginal vault.[1]

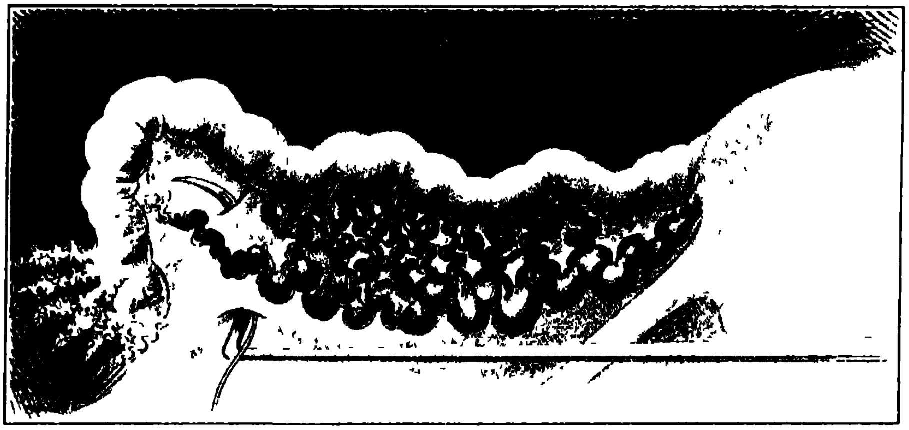

Fig 445 —Interrupted ligatures inserted at short intervals by means of long-handled curved needle (from Reed's "Gynecology").

Actinomycosis of the pelvic connective tissue has been reported by v. Hacker and by Sanger.[2] The physical signs and clinical history suggest a pelvic abscess. The diagnosis is made by the microscopical examination of the purulent discharge through a fistulous opening or incision and the discovery of the characteristic fungus.

Varices or varicocele of the broad ligament are quite frequently observed in connection with pelvic conditions determining a chronic congestion of the pelvic vessels such as fibroids, uterine displacements, chronic inflammatory conditions of the uterine appendages, obstructed circulation in heart and liver disease. A sedentary life, constipation, the long-continued working of a sewing machine, deterioration of the general health, and disease of the blood-vessel walls have been recognized as causes. The veins of the left broad ligament are more often and more seriously affected than those of the right, on account of the manner in which the efferent venous trunk empties into the left renal vein at a right angle to the blood-current. The veins of the pampiniform plexus are most often the seat of the varicosities.

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[1] Mayer, Inaug. Diss., Giessen, 1900. Good history and bibliography

[2] Von Rosthorn (*op cit*) gives these as the only recorded cases.

The *symptoms* of varices of the broad ligament are usually masked by those of associated and more serious conditions. They are a sense of heaviness and fullness, and a dull aching pain in the pelvic cavity, relieved by the recumbent posture, but returning as soon as the individual stands erect, and aggravated by exertion. It is claimed that the enlarged veins may be felt in a combined examination, but such delicacy of tactile sense is not often attainable.[1] The dilated veins may rupture with a dangerous, if not a fatal, intraperitoneal hemorrhage.

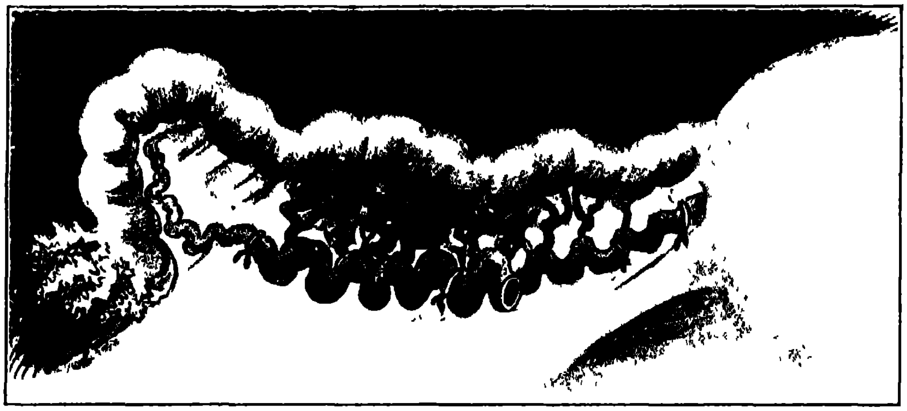

Fig. 446.—Division of the veins (from Reed's "Gynecology").

The *treatment* is the removal of the cause of the pelvic congestion, if possible; improvement of the general health; regulated exercises, baths, massage, and the internal administration of hydrastinin. If the condition is discovered after the abdomen has been opened, it may be radically cured by the ligation of the pampiniform plexus in sections and the exsection of the veins between the ligatures.

Phleboliths are calcified thrombi in the dilated pelvic veins. They vary in size and shape. They have been described as the size of a pea or of a spindle-shaped body almost two inches long and a third of an inch thick in the middle (4.5 cm. × 1 cm.).[1] They can be felt in a bimanual examination, especially if they are in the veins of the uterovaginal plexus. They may be removed in the course of an operation undertaken for some other purpose, but do not of themselves justify operative interference

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[1] The author has operated upon a number of cases by serial ligature and exsection of the pampiniform plexus, but has not made a positive diagnosis in a single one before the abdomen was opened.

Pelvic peritonitis is most often secondary to salpingitis. It may follow regurgitation through the tubes of fluid injected into the uterus, or of lochial discharge; inflammation of the ovaries; cellulitis; septic cystitis; metritis; perforation of the uterus; perityphlitis; and appendicitis.

Acute pelvic peritonitis is manifested by sharp pelvic pain, tympany, tenderness over the lower abdomen, fixation of the abdominal muscles, exudate occupying varying areas of the intraperitoneal pelvic cavity, fever, rapid pulse, constipation, nausea, and vomiting. The inflammation may subside, the pelvic exudate be absorbed, and no trace of the inflammation remain; but more commonly the exudate is organized into peritoneal adhesions binding the uterus to the rectum, the tubes and ovaries together and to the bowel If the infection is virulent or the resisting power of tissues low, suppuration follows and a pelvic abscess results, opening usually into the bowel, unless the pus is evacuated by surgical intervention before the intestinal coat is perforated.

The *treatment* of acute pelvic peritonitis is rest in bed, an ice-coil over the lower abdomen, a saline purge, and after a few days hot vaginal douches (a gallon of water at 120°) twice or oftener a day to promote resolution and diminish congestion. Opium should not be administered if it can be avoided. The pain is best controlled by heroin in doses of $\frac{1}{6}$ of a grain. In an adynamic condition of the patient, alcohol, digitalis, and strychnia are indicated. If symptoms of inflammation persist for many days, associated with the physical signs of exudate, fixation of the pelvic organs, and an irregular temperature, suppuration has probably occurred. Abdominal section or colpotomy is consequently indicated The choice between the two is governed mainly by the site of the inflammatory mass, and the patient's general condition. If the latter is bad, the vaginal operation is the safer of the two. If the exudate or abscess is confined to Douglas's pouch, a posterior colpotomy is most appropriate. For example, the posterior uterine wall is not infrequently perforated in an attempt to induce abortion Suppuration often follows. If the abscess is walled off and the suppuration does not extend upward into the general peritoneal cavity, a vaginal section with drainage of the cavity by a T-shaped rubber tube is very satisfactory. If the whole pelvis is involved, if the tubes and ovaries are affected, an abdominal section, with subsequent drainage through the vagina or through the abdominal wound by gauze and a glass tube combined, is much more successful. An unhealthy condition or actual perforation of the bowel-wall should be suspected and looked for in all cases of pelvic abscess. The discovery of this condition naturally necessitates drainage. No attempt, as a rule, should be made to close the opening in the bowel unless the hole is small and the surrounding bowel-wall is healthier than is usually the case. Abdominal drainage by tube and gauze, with daily irrigation of the pelvis after the third day, results in a spontaneous closure of the fistula in the majority of cases.

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[1] Zinke, in Reed's "Text-Book of Gynecology," p. 683, 1901.

The treatment of organized pelvic adhesions is considered in connection with displacements of the uterus and salpingitis.

Pelvic hematocele is an intraperitoneal and encapsulated effusion of blood. According to its situation it is a retro-uterine, ante-uterine, supra-uterine, or peri-uterine (lateral) hematocele. There may be a combination of these varieties. The commonest cause by far is a tubal abortion. Recent investigations give a frequency of this cause from 60 to 95 per cent. It is safe to say that at least two-thirds of all cases are traceable to tubal gestation. Other causes are bleeding from the tubes and ovaries at the menstrual periods, regurgitation of blood in gynatresia; rupture of a pelvic hematoma through the peritoneum, usually the posterior layer of the broad ligament, traumatism, as a violent coitus, or rupture of a blood-vessel in a gynecological operation; hemorrhagic salpingitis in association with systemic diseases, or obstructed pelvic circulation, malignant neoplasms of the pelvis, and a secondary hemorrhage following operations on the pelvic organs. The effusion of blood into the pelvis is usually the primary occurrence; its encapsulation by peritoneal adhesions, the secondary.

The **symptoms** of hematocele are sudden appearance of pelvic pain, fever (often to a great height), nausea and vomiting, tympany, a feeling as though the bladder and bowels must be evacuated, though the patient uniformly experiences difficulty in evacuating feces and is often unable to empty her bladder, the signs of internal hemorrhage if the effusion of blood is not quickly limited and on pelvic examination a tumor in the pelvic cavity, at first with the characteristics of free fluid in the abdomen, later a cystic swelling, or, if the blood clots, a solid mass, occupying one of the situations already mentioned or completely filling the pelvic cavity.

The terminations of a hematocele are complete absorption, usually with persistence of peritoneal adhesions ; recurrent hemorrhages with successive enlargements of the tumor ; persistence of the encapsulated accumulation of blood for months ; evacuation of the blood through the bowel, bladder, or vagina ; suppuration and the formation of a pelvic abscess ; persistence of the serum of the blood, and the formation of a cystic tumor.

The **treatment** is expectant if the effusion of blood is small in amount and soon shows symptoms in its diminishing size of rapid absorption. If the process of absorption is very slow, promising to require months for the complete disappearance of the tumor, if there is a recurrent hemorrhage, signs of suppuration, severe local disturbance, any symptoms indicating tubal gestation as the probable cause of the hematocele, the operative treatment is the safer and more successful. Posterior or anterior colpotomy may suffice if the blood is limited to Douglas's pouch or the uterovesical reduplication of the peritoneum. Usually an abdominal section is more satisfactory, giving a clearer view of the origin of the bleeding, a greater security against its recurrence, a better chance to evacuate all liquid and clotted blood, and not necessitating drainage as a rule, unless there are signs of an unhealthy condition of the bowel-wall, with threatened perforation, or suppuration of the hematocele. Colpotomy should be followed by drainage.

PART XI.

DISEASES OF THE URINARY TRACT.

Anatomy.—The **kidney** in the female deserves no special anatomical consideration. Its distinctive peculiarity is the tendency to abnormal mobility on the right side. About 20 per cent. of women have an abnormally mobile and displaced right kidney, but a very much smaller proportion exhibit symptoms from it.

The ureter[1] in the female is somewhat shorter and wider than in the male. It is accompanied into the pelvic cavity by the internal spermatic vessels In the pelvis the ureter comes into relationship from above downward with the following structures: the iliac vessels, the uterine artery, the ovary, the broad and round ligaments, the pelvic venous plexus, the cervix uteri, the vagina, the posterior vesical wall, the rectum. The course of the ureter is across and in front of the iliac vessels, just before the internal iliacs are given off, downward along the pelvic wall toward the tubal pole of the ovary, along the posterior border of the ovary to the pelvic floor. Running along the base of the broad ligament toward the cervix uteri, it is directed downward and forward between the anterior wall of the vagina and the posterior wall of the bladder, for a distance of 1 to 1.5 centimeters in close relationship with the former

Relations with the Uterine Artery.—The uterine artery runs with and anterior to the ureter almost immediately after arising from the hypogastric, for 4 to 5 centimeters, then crosses in front of it at the level of the cervix uteri, and pursues a course inward, by a turn at right angles toward the cervix, while the ureter continues its course downward and inward

Relations with the Pelvic Venous Plexuses.—In the neighborhood of the cervix the ureter runs between the vesicovaginal plexus on its outer side, and the uterovaginal plexus on its inner side

Relations with the Ovary.—The free border of the ovary, in the normal position of the latter, rests directly upon the ureter, with nothing but the peritoneum between the two.

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[1] The author follows mainly the description of Waldeyer in "Das Becken" A most instructive and useful description of the anatomy of the ureter is that by Byron Robinson ("Annals of Surgery," Dec., 1902) See also Tandler u Halban, "Topographie des weiblichen Ureters mit besonderer Berücksichtigung des pathologischen Zustände u. der gynäkologischen Operationen," Wien u. Leipzig, 1901.

Relations with the Cervix Uteri.—The ureter passes the cervix in a curve from above downward, from behind forward, and from without inward. From the point where the uterine artery

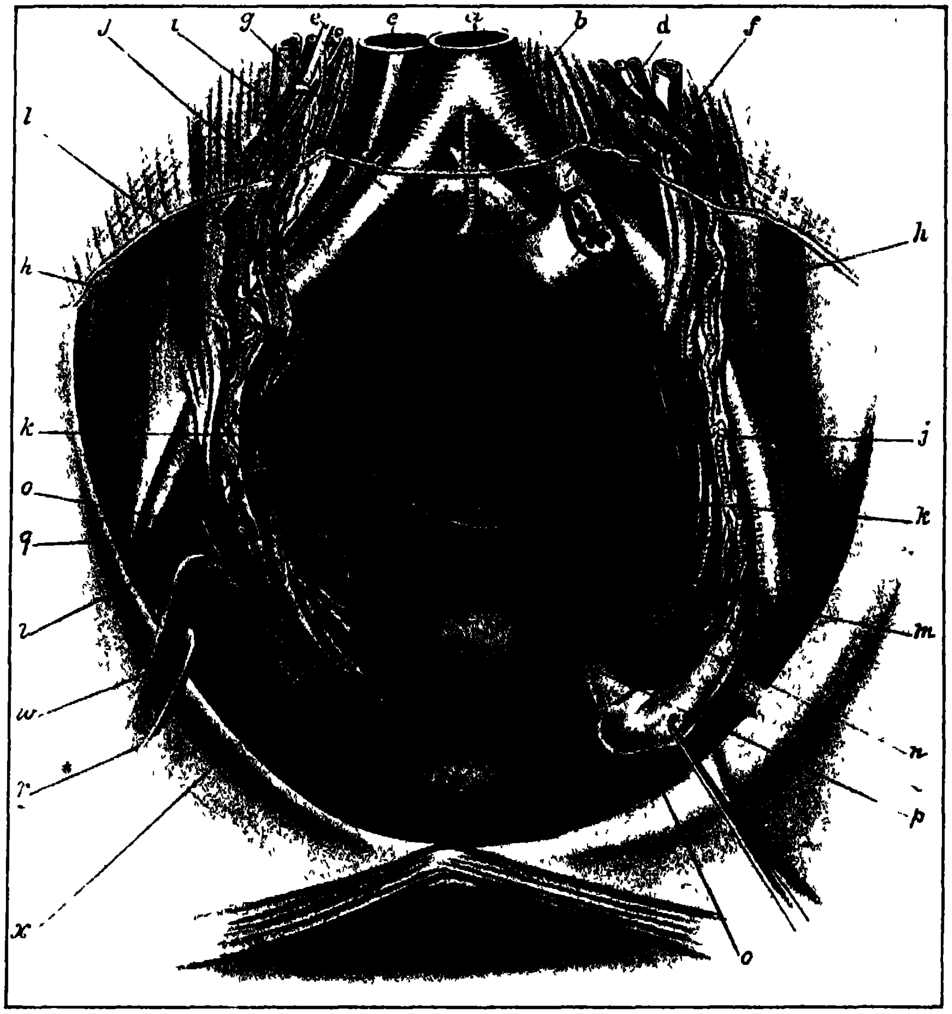

Fig. 447.—The anatomical relations of the ureter in the female: *a*, Aorta; *b*, median sacral artery; *c*, inferior vena cava; *d*, common iliac artery; *e*, ovarian artery; *f*, colon; *g*, superior ureteric artery: *h*, *h*, ureters; *i*, common iliac artery; *j*, *j*, internal ovarian venous plexus, *k*, *k*, right and left uterosacral ligaments; *l*, hypogastric artery; *m*, inferior ureteric artery, *n*, uterine artery; *o*, *o*, ovary, *p*, ovarian ligament; *q*,external iliac artery; *r*, epigastric artery; *s*, vaginal portion of the cervix uteri; *t*, bladder; *u*, uterus; *v*, external iliac vein; *w*, round ligament; *x*, Fallopian tube (Tandler and Halban).

crosses, it gradually approaches the cervix, so that it is nearer the anterior than the posterior half of the latter. The left ureter is commonly much nearer the cervix than the right. The lower the uterus descends or is pulled down, the nearer are the ureters to the cervix.

Relations with the Broad and Round Ligaments.—The ureter, after entering the base of the broad ligament, runs in the parametrium, leaving the peritoneum farther behind as it pursues its course to the bladder. It crosses under or behind the proximal portion of the round ligament, from which it is separated by the vesicovaginal venous plexus.

Relations with the Vagina.—From the level of the lowest portion of the anterior lip of the cervix the ureters run directly under the anterior vaginal wall in a curved line inward, downward, and forward for 1 to 1.5 centimeters to their entrance into the bladder. Pawlik has called attention to a transverse fold of mucous membrane on the anterior vaginal wall about 2.5 to 3 centimeters below the external os uteri corresponding with the base of the vesical trigonum, the lateral borders being represented

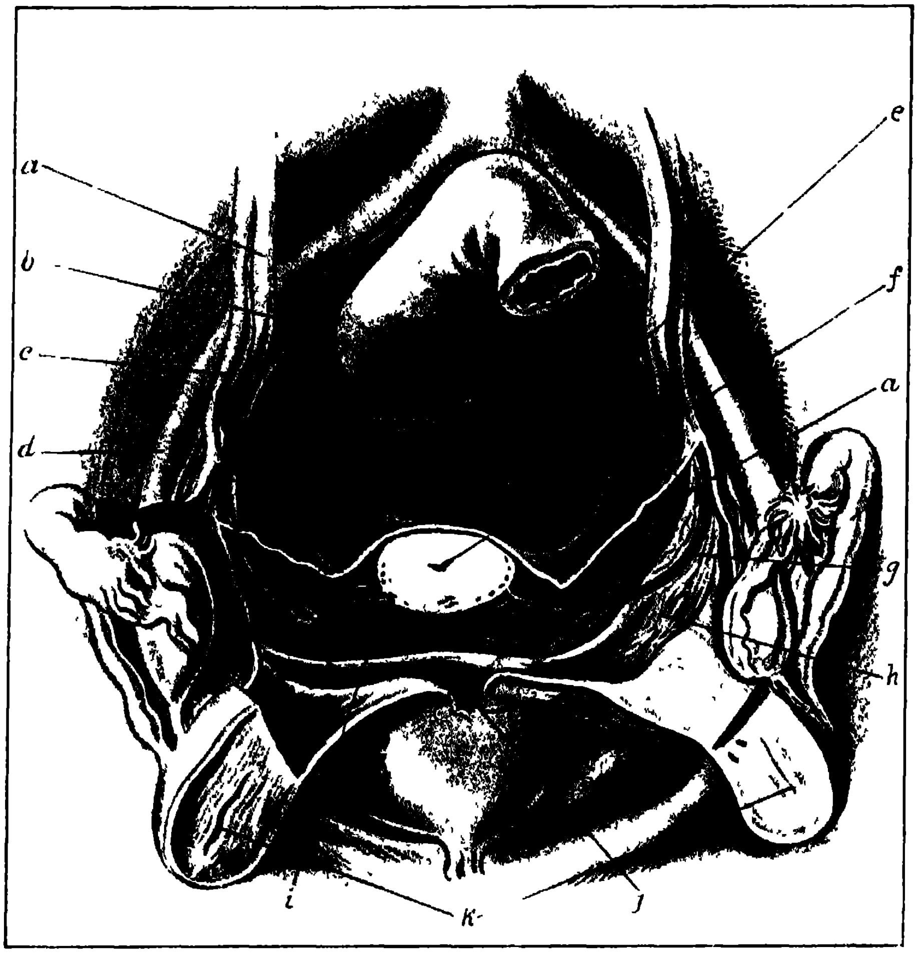

Fig. 448.—The relations of the ureter to the uterine artery and the cervix uteri: *a*, *a*, Ureter; *b*, hypogastric or internal iliac artery; *c*, ovarian suspensory ligament; *d*, external iliac artery; *e*, uterosacral ligament; *f*, cervical canal; *g*, uterine artery; *h*, parametrium; *i*, vaginal branch of uterine artery; *j*, posterior wall of bladder; *k*, uterus, bisected (Tandler and Halban).

by two diverging folds springing from the upper end of the anterior column of the vagina. The ureters are above this area in the vaginal wall.

Relations with the Bladder.—For the space that the ureters run in relationship with the vagina they are also directly under the posterior vesical wall. As they enter the bladder they turn quite sharply inward. For a short distance the ureter runs within the bladder-wall (intramural portion). The greater the distention of the bladder, the wider the separation of the ureters and the greater their elevation in the pelvic cavity.

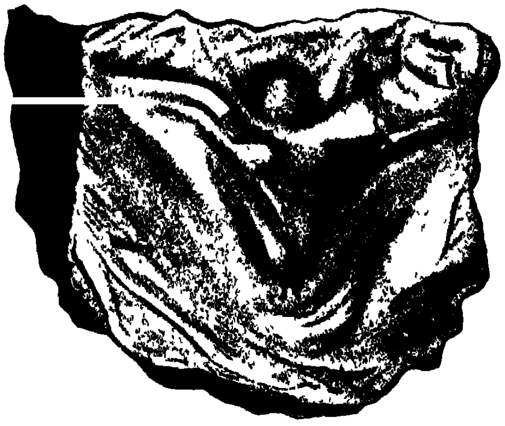

Fig. 449.—Relations of the ureteral orifices with the internal meatus of the urethra (Viertel)

The following measurements of the distances between the ureters at different levels are quoted by Waldeyer from Faytt:

Separation of the ureters at their origin from the kidneys	6.0–9.0 cm.
Separation of the ureters at the level of the promontory	7.0–8.0 cm.
Separation of the ureters at the level of the fourth sacral vertebra	6.5–9.0 cm.
Separation of the ureters at the level of the fundus uteri	6.8–9.5 cm.
Separation of the ureters at the level of the isthmus uteri	5.0–6.5 cm
Separation of the ureters at the level of the external os uteri	4.0–4.5 cm.
Separation of the ureters at their entrance in the bladder-wall	3.0–4.5 cm.
Separation of uretal orifices in the base of the vesical trigonum	2.5–3.0 cm.
Separation of the left ureter from the cervix	0.6–2.0 cm
Separation of the right ureter from the cervix	2.0–3.0 cm.

The bladder of the female is broader than that of the male, but not so large in its anteroposterior diameter. When empty there is a depression upon its upper wall where the fundus uteri rests, and the upper joins the posterior wall at quite a sharp angle. The capacity of the female bladder is ordinarily less than that of the male, and its walls are a third thinner. On this account they are more elastic, so that the female bladder is capable of greater distention under unusual internal pressure than is the male. It lies deeper in the pelvis than it does in the male. The upper and posterior walls are in relation with the small intestines, the fundus and corpus uteri. The posterior wall below the angle of its junction with the upper wall is in relation with the vagina and the anterior parametrium. In front and below is the pudendal venous plexus; to either side and below, the vesicovaginal plexuses. Behind them is the loose connective tissue connecting the bladder with the vagina and cervix. The former can easily be separated by a blunt dissection as far down as the urethra, where the vaginal wall adheres tightly to the urethrovaginal septum. In front are the symphysis and fatty connective tissue. Above, the peritoneum covers the upper wall of the bladder, but not the anterior or the posterior wall in the empty condition. When distended, the upper portion of the anterior wall is covered by peritoneum, but there remains a space varying with the degree of distention, in which the anterior wall above the symphysis is below and outside of the peritoneal cavity.

The urethra of the female is a cylindrical canal 3 centimeters long, 7 to 8 millimeters in diameter, but with such elastic walls that a gradual distention to 2.5 centimeters or more is possible without incontinence of urine. There is normally a spindle-shaped dilatation of the central portion of the canal. The urethral walls are 0.5 centimeter thick. There are the following divisions of the urethra: The internal or vesical orifice, the intramural, the superior or free, the inferior or vaginal portions, and the external or vestibular orifice. According to its relations with surrounding structures, the urethra is further divided into the supratrigonal, trigonal, and prætrigonal portions, or from its relation to the levator ani muscles which run on either side of it, into the superior portion above the pelvic diaphragm, the pelvic portion, and the perineal or inferior portion.

The intramural portion runs for a very short distance in the bladder-wall. The superior or free portion ends where the urethral and vaginal walls firmly unite to form the urethrovaginal septum. The inferior or vaginal portion ends at the external orifice or meatus. The last is much the longest of the three.

The mucosa of the urethra is dark red or purplish in color. The cells vary, from below upward, from pavement epithelium in layers, to round and cylindrical cells. There are small tubular glands in the mucosa, said to be homologues of the prostatic glands. A group of these glands empty by a special efferent duct on each side of the external meatus (Skene's ducts). There are three layers of muscle-fibers around the urethra: an internal longitudinal layer, next a middle, well-developed circular layer, and finally the striped circular fibers derived from the urogenital trigonum muscle (compressor urethræ). The unstriped circular layer of muscle forms the leiosphincter of the urethra. The striped circular fibers, present along the whole length of the anterior urethral wall, but only directly beneath the bladder in the free portion on the posterior urethral wall, constitute the rhabdosphincter of the urethra.

The urethra runs a curved course downward and a little forward, with its convexity directed backward. The internal orifice is below the middle of the symphysis and about 2.5 centimeters back of it. In front and to the sides are the pudendal plexus, the urogenital trigonum, the crura of the clitoris, and the bulbs of the vestibule. Behind is the vagina, separated from the free portion by fibers of the urogenital trigonum muscle and loose connective tissue, but intimately united with the inferior or vaginal portion

The arterial supply is from the internal pudic, the inferior vesical, and branches of the cervicovaginal branch of the uterine artery.

The veins empty into the pudendal and vesicovaginal plexuses and are continuous with the sinuses of the cavernous bodies of the clitoris and the bulbs of the vestibule.

The spinal nerve-supply is from the pudic nerve.

The lymphatics empty into the hypogastric and the inguinal glands

The Examination of the Female Urinary Tract.—The examination of the urine is treated in special works on the subject Investigation of the urine from the female bladder is governed by the same rules that control such examinations in general, except that it is always better in the female to examine a catheterized specimen The collection of the first part of the urine in a separate vessel is of value in cases of hematuria and of pyuria to determine whether the blood and pus come from the bladder or kidneys. The estimation of the amount of residual urine by catheterization after spontaneous urination is often important in cases of cystitis associated with cystocele In suspected neoplasms of the bladder, the eye of the catheter, if it is employed, and the urinary sediment obtained by settling in a conical glass or by the centrifuge, may contain fragments that are suitable for microscopic examination. In addition to the examination of the urine and the use of the catheter, the female urinary tract is examined by the cystoscope, the urethroscope, the fingers, the vesical sound, and the ureteral bougie or catheter

Cystoscopy.—The inspection of the interior of the bladder is possible of late years by means of special instruments—cystoscopes Those at present most generally used are the Nitze, the cylindrical specula of Pawlik and Kelly, the Pryor cystoscope, and the Elsner cystoscope

No cystoscope is satisfactory that does not carry a light at its distal or intravesical end. Hence the cylindrical specula of Pawlik and Kelly, through which the light must be reflected from the exterior, are awkward and inconvenient

The Nitze cystoscope has great advantages : the illumination is brilliant; it can be used in the ordinary dorsal position; it magnifies the objects on which it is brought to bear; its field of vision is enlarged by an ingenious system of lenses; the catheterization of the ureters by its aid is particularly easy, and the caliber of the instrument is moderate, so that it can be introduced without great discomfort to the patient. But it has several unpleasant disadvantages: It is necessary to distend the bladder with water before it is inserted; the instrument can only be cleansed by immersion in carbolic acid solution; it is impossible, therefore, to make it absolutely aseptic; if it is broken or out of order, it is necessary to send it back to Germany for repair;[1] the light generates such heat that there is danger of burning the bladder-walls or the urethra; it requires a very strong battery to furnish enough power for the light,[2] and it is impossible to make applications to the bladder or to touch anything through it One sees well, but that is all. The Elsner cystoscope has replaced all other instruments in the author's practice. It has all the advantages of the Nitze instrument without its disadvantages.

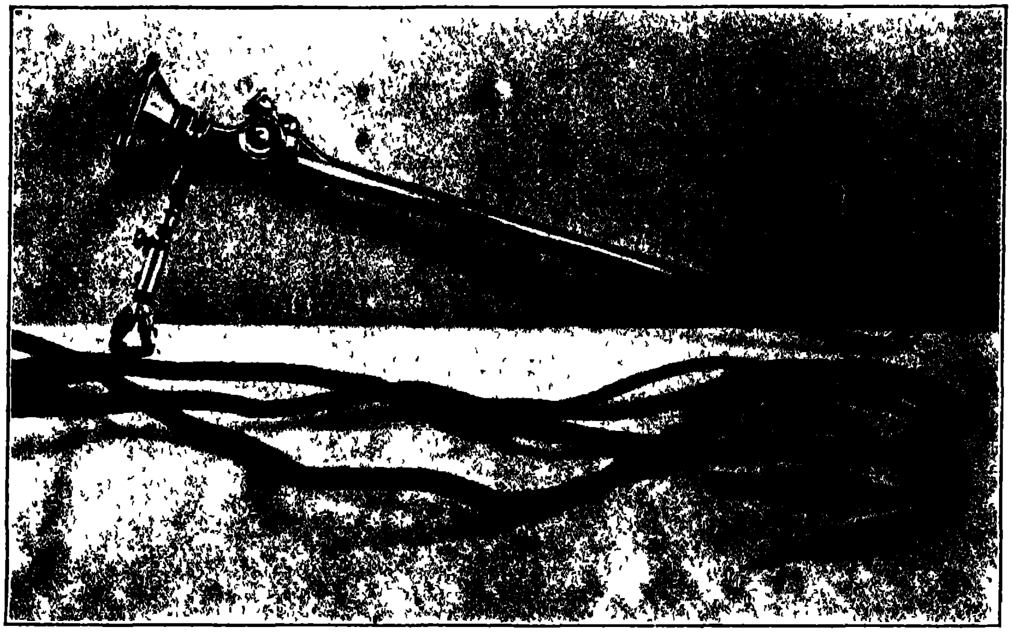

Fig 450—Nitze's cystoscope with the electric wires attached.

Cystoscopy by the Nitze cystoscope is conducted as follows: The woman is arranged in the ordinary dorsal position; the external meatus is cleansed with pledgets of cotton and sublimate solution; the cystoscope is submerged in carbolic solution, 5 per cent.; the bladder is distended with 150 c.c. sterile water by means of a funnel and rubber catheter, the cystoscope is anointed with sterile glycerin as an unguent; if the urethra is sensitive, it may be cocainized by means of a Fritsch's urethral tube attached to a hypodermic syringe After the introduction of the cystoscope the attachment to the battery is made and the light is turned on. The four quadrants of the bladder are examined in turn, allowance being made for the magnification of the objects seen. Care must be exercised not to touch the bladder-walls with the end of the instrument, which becomes very hot, and to turn off the light and wait a moment before withdrawing the tube through the urethra.[1]

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[1] The author has been obliged to send his instrument to Berlin, and was then compelled to pay full duty on it again when it entered America.

[2] This disadvantage has recently been obviated by an ingenious attachment to any electric light fixture, furnishing light for the weakest or strongest lamps of all the endoscopes (made by the Rochester Electro-surgical Company).

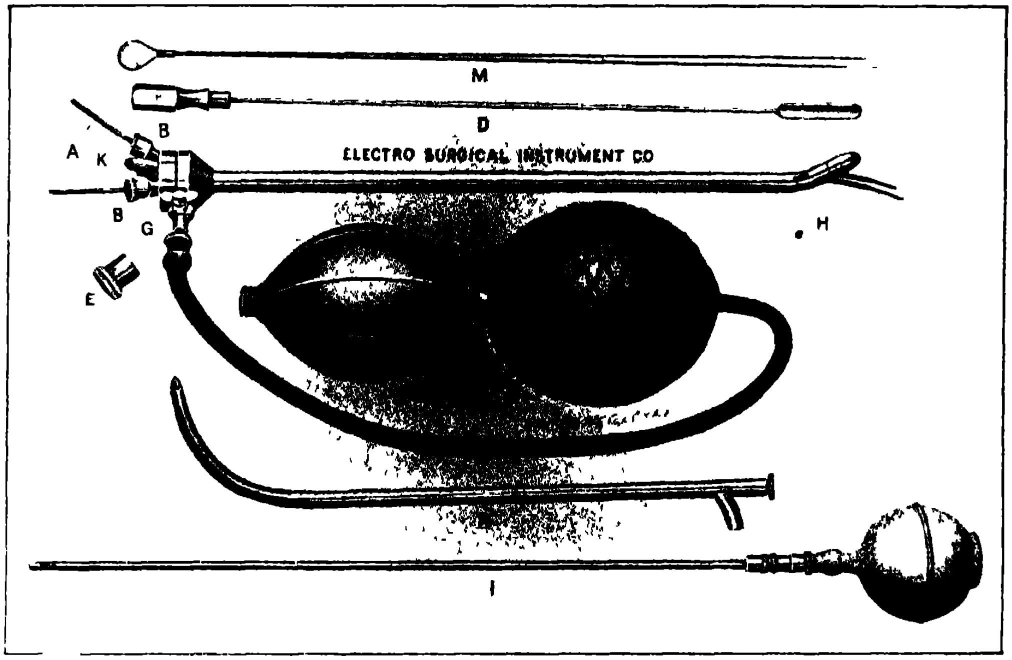

Fig. 451.—Elsner's ureter cystoscope: A, Catheter; B, catheter carrier tubes; C, cystoscope, D, obturator; E, window; F, dilating bulbs, G, stop-cock, H, lamp; I, irrigator and aspirator; K, current attachment, M, Elsner stiletto probe; N, cocain applicator.

The Elsner instrument is used in the following way: The tip of the cystoscope is unscrewed and the lamp removed; the instrument is then boiled; the patient is put in the dorsal position with the buttocks elevated, by tilting up a Trendelenburg table and by placing an Edebohls nephrorrhaphy cushion under her hips; the external meatus is cleansed and she is catheterized; the urethra is cocainized by Fritsch's tube (4 to 10 per cent. solution); if necessary, it is dilated by bougies; a lamp is inserted in the cystoscope and the top screwed tight, all manipulations being conducted with gloved hands; the cystoscope, provided with an obturator, is anointed with glycerin and inserted; the light is turned on after the connection with the battery is made, recollecting that the small lamps, which do not become hot, will not stand a current of more than 6 volts. On removing the obturator the bladder is distended with air. If it does not expand satisfactorily, the instrument is provided with a glass window to be inserted in the proximal end and with a nozzle and stop-cock through which either air or water can be injected in the bladder; if the former is used, the intake of the bulb syringe should be held near the flame of an alcohol lamp so that the air shall be hot and consequently not irritating to the vesical mucosa. Accumulating urine can be removed by the suction apparatus (Fig. 452). This instrument not only allows a good view of all portions of the bladder, but permits also direct applications to the mucosa, the insertion of ureteral catheters, the use of forceps, and of the wire écraseur.

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[1] I have had made cold lamps of equal brilliancy, which are a great improvement over those that come from Germany

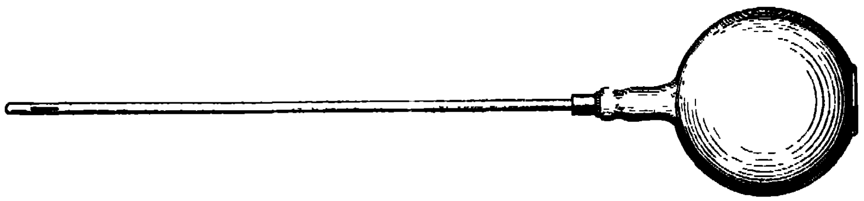


Fig 452.—Aspirator for sucking residual urine out of the bladder

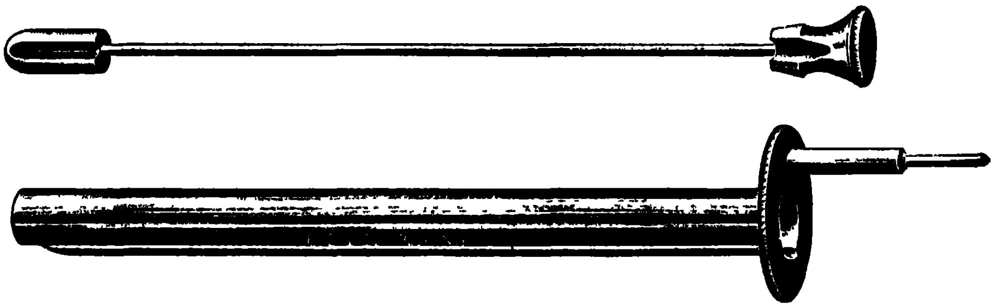


Fig 453.—Urethroscope and its obturator.

The urethra may be examined by cylindrical specula and reflected light, but the best urethroscope is a cylindrical speculum provided with a small electric lamp at its distal extremity. Guarded by its obturator, it is inserted past the sphincter of the bladder. The obturator is withdrawn, the light is turned on by the rheostat of the battery to which the wires are attached, and the instrument is slowly withdrawn, so that the vesical sphincter and successive folds of the mucosa come plainly into view. The bladder must be empty before the urethroscope is inserted.

The battery for the cystoscope and urethroscope may be a small, light, dry-cell battery with a rheostat, if one uses the American instruments. The Nitze cystoscope requires a much more powerful and heavier battery. There has been recently introduced a very convenient attachment to the electric light fixtures of any house or office that gives the necessary light for all kinds of endoscopes, obviating the necessity of transporting a

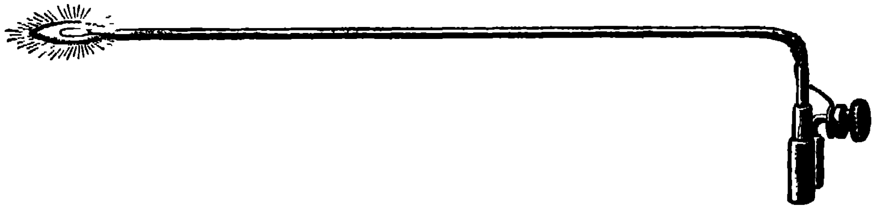


Fig 454.—Light carrier for urethroscope.

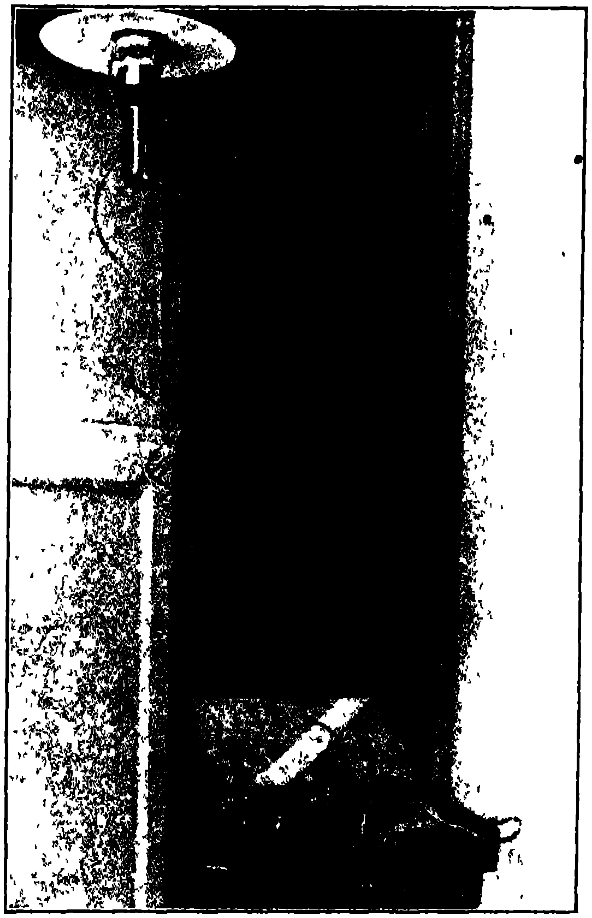


Fig. 455.—Attachment to electric light fixture for the light of any of the endoscopes.

battery and avoiding the awkward possibility of a failure of current in the midst of an examination.

The ureters are examined by the cystoscope, the ureteral sound or catheter, and by palpation.

By the cystoscope the urethral orifices are inspected. They lie at either extremity of the inter-ureteric ligament, at the angles of the base of the trigonum Their separation from one another varies from 13 to 40 millimeters, and the distance of the inter-ureteric ligament from the vesical sphincter varies from 8 to 35 millimeters. One ureteral orifice is first located by deflecting the cystoscope toward the corresponding side; the other is then found by moving the end of the cystoscope along the inter-ureteric ligament until the other comes in view. The orifices are usually at the apex of a little nipple and are circular in outline. They may be slit-like in shape, or simple depressions without a nipple-like projection. Blood-vessels commonly radiate from them in the bladder-wall and the urine is projected from them in intermittent spurts showing the peristalsis of the ureters and the probability that they are provided with a sphincter that prevents regurgitation of urine from the bladder.

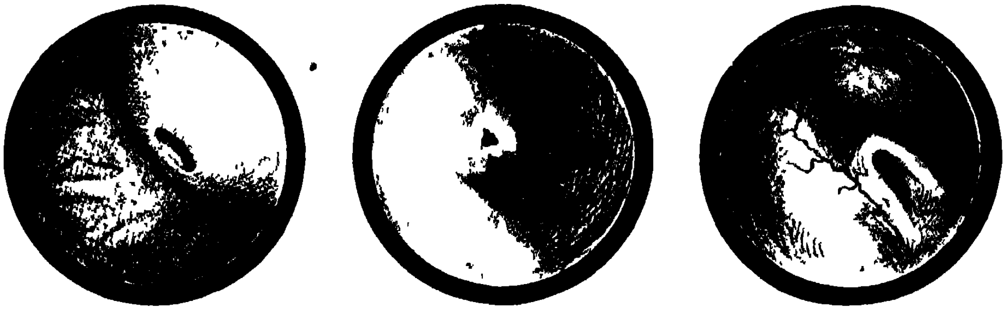


Fig 456 —Different forms of ureteral orifices (Viertel).

If it is desired to collect the urine from the ureters separately, a ureteral catheter may be readily inserted by either the Nitze cystoscope or the Elsner instrument. The latter is provided with two separate little tubes each furnished with a flexible catheter so that both ureters may be catheterized, one after the other, without withdrawing the cystoscope. It is usually more convenient, but not necessary, to keep a stylet in the catheter until its point is well engaged in the ureteral orifice, when it is withdrawn and the catheter is pushed in as far as is desired, even to the pelvis of the kidney The catheters should be of different colors,—red and black,—and a note should be taken of which is in the right, which is in the left ureter. If they are pushed in far enough there is little danger of their slipping out

They can remain for as many hours as is desired, until a sufficient quantity of urine is collected in separate vessels from each kidney or until ample time is allowed to demonstrate the absent or deficient function of one kidney. Meanwhile the woman is removed from the table on which the cystoscopy has been practised and rests comfortably in bed.

If it is desired to sound and not to catheterize the ureters, the procedure may be the same, or an inflexible metal instrument may be used. Kelly has designed a wax-tipped sound to test for calculi. The *x*-ray, however, is more reliable for this purpose. Metal or wax-tipped sounds must be inserted through the main lumen of the cystoscope, which is more difficult than through the special tube in the wall of the cystoscope provided for the purpose They can only be employed through the open cylindrical instrument. No direct manipulation or instrumenta-

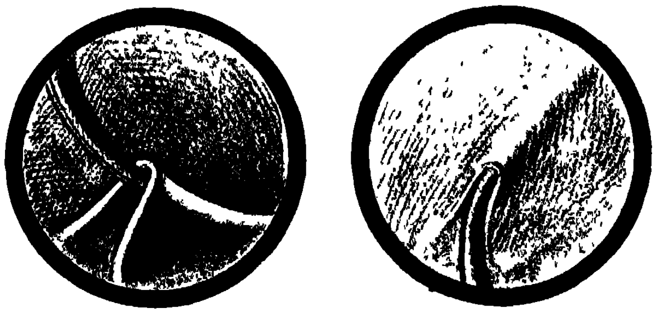


Fig 457 —Ureteral catheters in the ureters (Viertel).

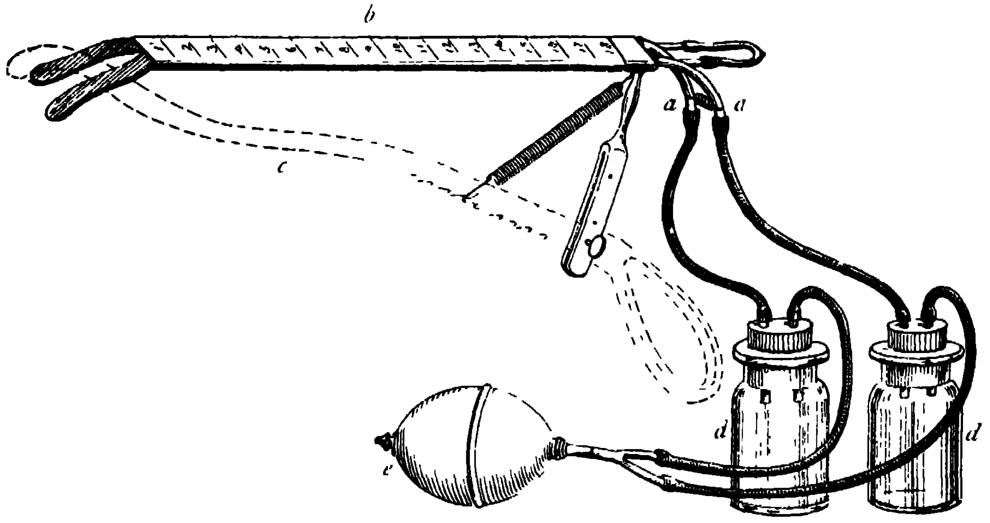


Fig 458 —Harris' instrument for collecting the urine separately from the two kidneys: *a*, Catheters turned down; *b*, sheath with scale; *c*, vaginal rod; *d*, *d*, vials for collecting urine; *e*, exhaust pump.

tion is possible through the Nitze cystoscope, except the use of the wire snare through the "operating" cystoscope

Two instruments have been designed to collect the urine separately from the ureters without catheterization. The Harris instrument makes a watershed of the vesical wall between the two ureteral orifices. It is reliable and efficient for its purpose, no doubt, but is painful to the patient and scarcely inspires the physician with the same certainty that he is obtaining the result desired as does the catheterization of the ureters. The author has used it if catheterization of the ureters has been unsatisfactory or is impracticable.

The other instrument, designed by Cathelin, is more useful in the male bladder. It is supposed to establish a water-tight barrier between the two ureteral orifices by a rubber diaphragm.

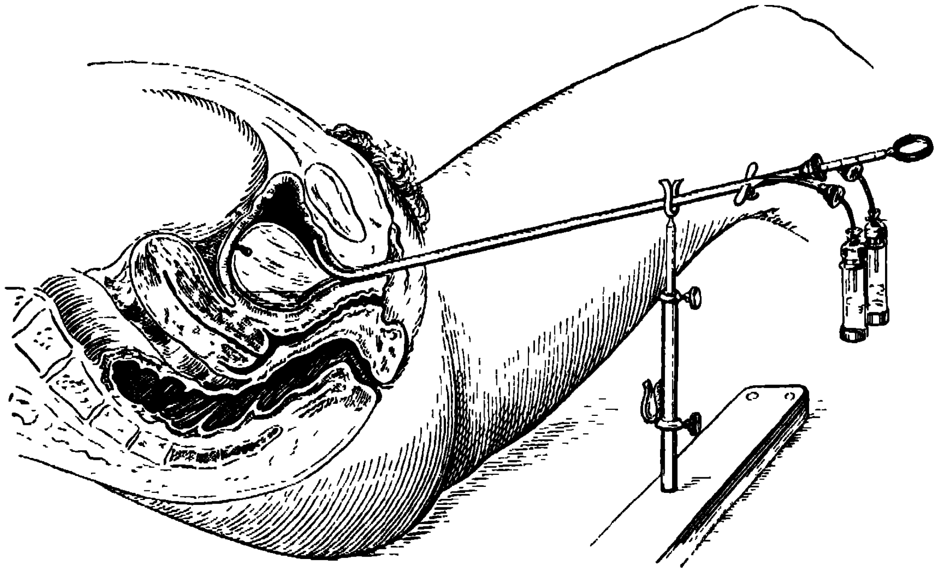


Fig. 459.—Cathelin's urinary segregator.

Palpation of the ureters is only possible if they are pathologically thickened and if they are not surrounded by cellulitic exudate. In a favorable case they may be felt in their course from the bladder through the vesicovaginal septum and the parametrium by a vaginal examination. The fingers of the left hand palpate the left ureter while pressure is made from above through the abdominal wall. The right hand is used internally to palpate the right ureter. The index finger or the index and middle fingers are swept outward from the middle line over the upper anterior vaginal wall until the cord-like ureter is felt The Fallopian tube or the round ligament might be mistaken for it, if one is not careful to trace the course of the structure felt.

The kidney is examined by bimanual palpation. The most convenient way is to sit the patient bolt upright, with the back supported, the feet resting upon a support that keeps the legs and thighs well flexed, the arms hanging limp by her side, while she breathes deeply through her mouth. One outspread hand of the examiner is placed over the lumbar region, the fingers of the other are inserted under the floating ribs in front. The mobility, size, and position of the kidney may be thus appreciated in a favorable case—that is, if the patient is thin, has relaxed abdominal walls, and particularly if the kidney occupies a lower position than normal. Other methods of palpating the kidney are practised as follows: (1) The patient is placed in the dorsal position, with the thighs flexed and abducted and with the legs flexed on the thighs; (2) the patient stands with the body bent forward, supported by resting her hands on the back of a chair; or (3) she assumes the knee-elbow position. In any of these positions, the palpation is conducted by the physician as already described, the lower pole of the kidney at least being caught and balanced between the hands. If it is compressed between the fingers of the outspread hands, it may usually be displaced upward under the ribs. If the kidney is the seat of a tumor, the ordinary dullness on percussion in the loins extends outward and forward. The course of the colon over the tumor may be mapped out. There is no resonance behind a renal tumor.

Congenital malformations of the bladder are in the main the same in both sexes. Exstrophy, diverticula, and vertical septa are more common in males than in females. There may be absence of the bladder with insertion of the ureters in the urethra Hypospadias and epispadias have the peculiarities in the female that in the former there is often an associated ill development of the vagina and coitus may be practised *per urethram* into the bladder without developing incontinence; in the latter there is an opening into the bladder through the lower anterior abdominal wall above the symphysis.

Displacements of the Bladder.—In addition to the common displacement of a cystocele already described, there may be a hernia of the bladder through the inguinal or crural canal. There is usually a sacculated condition or a diverticulum in such cases.

Diseases of the Bladder.—**Cystitis** is an inflammation of the vesical mucosa caused by microbic infection or by chemical irritation. The vast majority of cases are due to infection. The micro-organisms responsible for the inflammation are bacilli or cocci. Among the former are the tubercle bacillus, the bacterium coli commune, the urobacillus liquefaciens septicus, the coccobacillus, and the typhoid bacillus; among the latter, gonococci, streptococci, and staphylococci. The micro-organisms are usually introduced into the bladder by a catheter, but they can wander in from the urethra; they may come from the blood, as in typhoid and the other infectious fevers; they may be carried into the bladder through a perforation in its wall by which a pelvic abscess may be evacuated; they may penetrate the bladder-wall, as in a case of septic peritonitis or paravesical abscess before rupture; they may come direct from the bowel through an enterovesical fistula; and they may descend from the kidneys or ureters. The vesical mucous membrane in its normal condition is resistant against infection. Pus may flow through the bladder from a pelvic abscess or from the kidneys without exciting cystitis. Predisposition is usually necessary for the outbreak of a cystitis, in a lowered vitality of the bladder epithelium, congestion or traumatism of the mucosa. The commonest cause of a lowered resisting power is overdistention of the bladder. Particularly virulent micro-organisms, however, are capable of exciting an inflammation in a perfectly healthy and normal vesical mucosa. It is said that two hours suffice for the ammoniacal decomposition of the urine and the inception of a septic cystitis (Roosing).

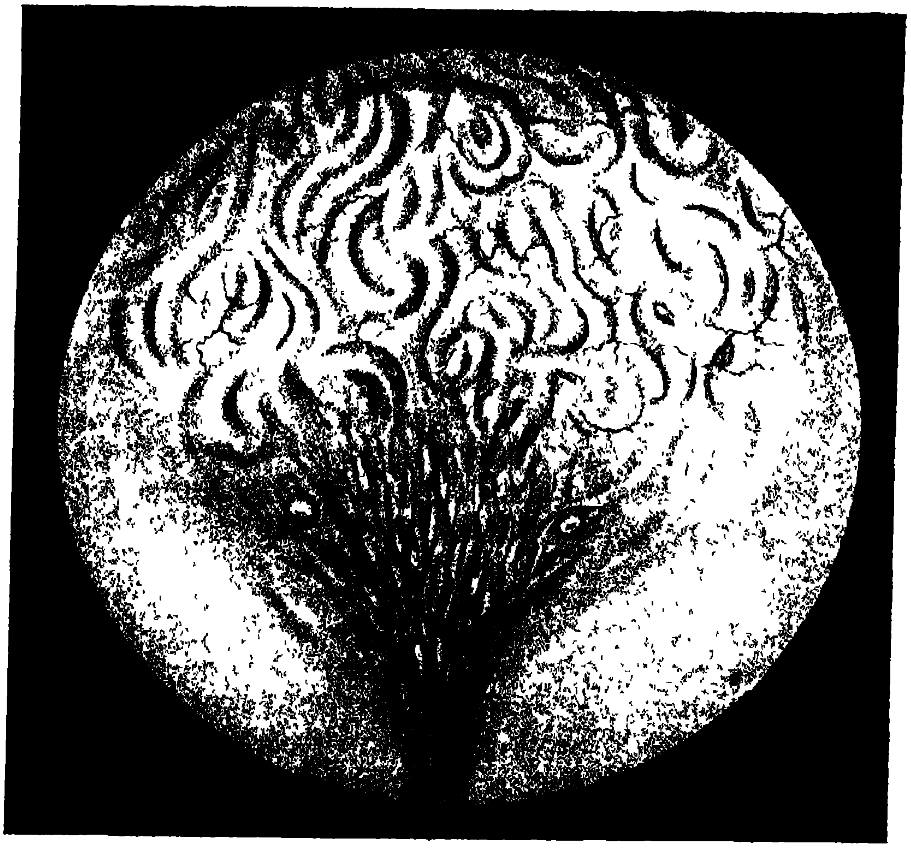
Chemical irritation as a cause of cystitis may follow the administration of drugs. Cantharides has this power preëminently. It is also the result of injecting strong solutions into the bladder. It is a disputed point whether the ammoniacal decomposition of urine by the micrococcus ureæ and other organisms is a cause or the effect of cystitis. The weight of expert opinion leans to the latter view.

The Varieties of Cystitis.—The commonest kind of cystitis is an acute catarrhal inflammation affecting most severely the base of the bladder, but extending at least as a marked injection of the vessels, to the rest of the mucosa. Under appropriate treatment this form of cystitis quickly subsides and disappears without serious consequences. If neglected or inappropriately treated, it results in a chronic inflammation of the trigonum and neighboring mucosa (see Plate), with distressing symptoms, often obstinately resisting treatment. Another frequent form is a hyperemia rather than an actual inflammation from the congestion of menstruation, pregnancy, neighboring pelvic and abdominal tumors, masturbation, sexual or alcoholic excess, and the use of some drugs, as cantharides. The presence of a stone or a neoplasm in the bladder may produce either a hyperemia or an intense cystitis.

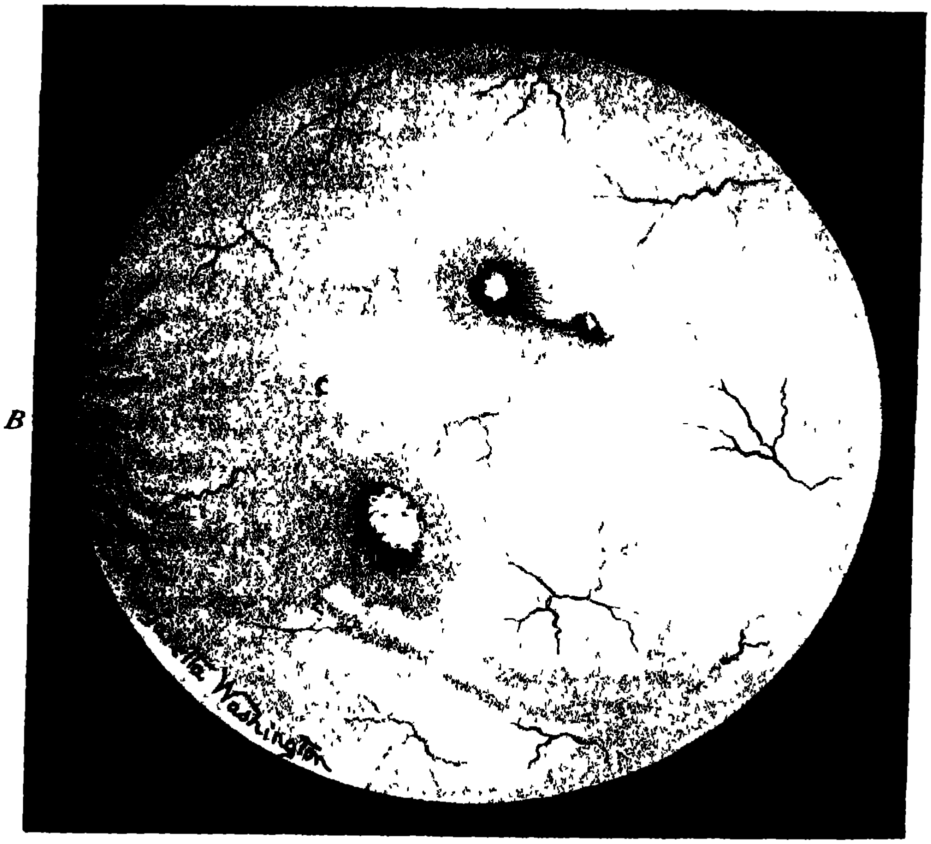
Membranous cystitis is rare, occurring in the gravest forms of vesical infection in the puerperium or in consequence of the ex-

PLATE 13.

A



B



A, Cystitis of the trigonum; *B*, ulcerative cystitis, with a history of gonorrheal infection.

treme distention of the bladder with an incarcerated retroflexed uterus or with a myoma impacted in the pelvis. The vesical mucosa is thickened, gangrenous, and exfoliated. Masses of foul membrane are expelled with the urine, which has a horribly fetid odor, or block up the neck of the bladder and obstruct the flow of urine Suppuration occurs under the exfoliated membrane and pus may be evacuated in large quantities by pushing a catheter through the soft, necrotic mucosa.

Tuberculous cystitis is usually seen in young women or girls and is almost always the consequence of a tuberculous nephritis. There first appear little grayish nodules in the trigonum and neighborhood of the ureteral orifices, surrounded by an area of reddened membrane; caseation and ulceration of the tubercles rapidly follow, with coalescence of the ulcers, until, in extreme cases, the whole interior of the bladder is an ulcerated surface, the color of raw beef

Gonorrheal cystitis predisposes to tuberculosis. The urine, in spite of the large quantity of pus in it, remains acid. Ulcerative cystitis is not always tuberculous. Small ulcers develop in the gonorrheal form (see Plate), may be the result of pressure-necroses in labor, and may be due to thromboses or emboli in the vessels of the bladder-wall. In exceptional cases the ulcer perforates the bladder-wall.

Symptoms and Diagnosis—The three distinctive symptoms of cystitis are vesical tenesmus, pain, and mucopus in the urine In the acute form there is fever, usually moderate in degree, sometimes high Hematuria is not symptomatic of cystitis in the female, as it often is in the male. In tuberculous cystitis there may be intense vesical pain and tenesmus and evidence of tuberculous processes elsewhere. There is always loss of weight. Tubercle bacilli in the urine are a positive sign, but they are not easily or always found.[1] Membranous cystitis is recognized by the mechanical obstacle to the evacuation of the bladder, by the foul odor, by the passage of necrotic mucosa, and by the feel of the desquamated membrane when the catheter is introduced; also by the evacuation of pus collected behind the membrane. There may be pneumaturia and a fecal odor to the urine if there is a communication with the bowel; but pneumaturia is possible without a urinary-fecal fistula. If the latter exists, vegetable matter and striped muscle-fiber may be seen in the urine in a microscopical examination. The best and surest means of diagnosticating cystitis in all its forms is cystoscopy. Tubercles, ulcers, fistulæ, foreign bodies, neoplasms, and calculi can be seen. The degree and extent of the inflammation of the mucous membrane are also plainly visible.

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[1] The examination for tubercle bacilli in the urine is conducted as follows: The total amount of urine passed in twenty-four hours is collected and allowed to sediment for twenty-four hours. The supernatant urine is decanted off and the sediment is centrifugated in successive portions, each time pouring off the clear urine, until the tube of the centrifuge is half full of the purulent sediment A portion of this is then spread thinly on glass slides, at least four of which should be prepared A slide is preferable to a cover-glass, as it gives a wider field for examination The slides are then fixed and stained in the ordinary way; by hot carbol-fuchsin for five minutes, decolorized by 5 per cent. sulphuric acid till no red tinge remains on the slide (usually thirty to sixty seconds), and counterstained by an aqueous solution of methylene-blue This method gives a clearer specimen than can be obtained by the use of Gabbett's stain

Treatment.—For an acute cystitis the treatment should be rest in bed, liquid diet, large quantities of water by the mouth, the administration of urotropin and salol, each 5 grains, alternating every three hours, and an irrigation of the bladder twice a day with boracic acid solution, grs. xv–f℥j, through a two-way catheter or by an ordinary soft-rubber catheter attached to a funnel; 4 to 8 ounces of the solution should be poured in at a time, allowed to remain for a minute or two, and then allowed to flow out. If the two-way catheter is used, the outlet is stopped by the thumb until the desired quantity is injected; if the funnel and catheter are employed, depressing and inverting the former drains off the fluid in the bladder. The injection should be repeated at least half a dozen times at a sitting If the fluid is simply allowed to flow through a two-way catheter, only the lower part of the bladder is washed unless the tip of the catheter is pushed in until it impinges against the vertex of the bladder; even then the lateral walls are not irrigated. If the cystitis is gonorrheal in origin, 4 to 6 ounces of a 2 to 5 per cent. argyrol solution should be injected after the boracic acid irrigation and should be allowed to remain until it is spontaneously evacuated.

In ulcerative cystitis the ulcers should be treated through a cylindrical cystoscope by applications of the strongest possible solutions of nitrate of silver or by fusing the solid salt on the end of a probe. A few applications usually suffice. If they are followed by bleeding from the ulcerated surfaces, Shober suggests applying powdered suprarenal extract or adrenalin solution. If the ulceration is too extensive for such strong applications, the treatment may be like that of gonorrheal cystitis. Persistent irrigation alone will sometimes cure the most unpromising cases.[1] Drainage by a vesicovaginal fistula is sometimes necessary. A sound is inserted through the urethra past the neck of the bladder. Its point, held firmly in the middle line, is depressed to make the vesicovaginal septum prominent; a vertical opening is made through the septum upon the point of the sound with knife or scissors; the vesical is united to the vaginal mucosa with interrupted catgut sutures. After the cystitis is cured, the opening is closed by an operation for the vesicovaginal fistula. Urethral drainage may suffice, and, if it does, is to be preferred to vesicovaginal drainage. A Skene's catheter is inserted in the urethra; a rubber tube is attached to it and led into a urinal. Regular irrigation is required to keep the catheter from being clogged with urinary salts. A simpler and often a better plan is to fill the bladder with water; to insert a piece of rubber tubing in the urethra until the water in the bladder escapes,—that is, just past the sphincter at the neck of the bladder,—and then to fasten the tube by a few fine silk stitches to the mucous membrane of the external meatus. The tube must be long enough to be led into a urinal. The external meatus should be cocainized before inserting the tube and the stitches. Membranous cystitis usually requires vesicovaginal drainage, frequently repeated irrigation with boric acid solution, the removal of necrotic membrane with forceps through the fistula or the urethra, and the evacuation of pus collected behind the partially exfoliated membrane. It may be necessary to direct the treatment rather to the cause of the inflammation than to the cystitis itself. Calculi and neoplasms must be removed. If there is a constantly recurring infection from the kidneys, a pelvic abscess, or the bowel, the pyelitis, the pelvic abscess, or the fecal fistula must be cured before the cystitis can be expected to get well. Nephrotomy, drainage of the pelvis of the kidney, or nephrectomy may be required. It may be necessary to drain a pelvic abscess through an incision into the parametrium above Poupart's ligament, or in the same way to establish a vent for the fecal fistula, whereupon the opening in the bladder commonly closes quickly.

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[1] I have seen a tuberculous ulceration of the bladder occupying its whole inner surface cured in this way. Some months after the institution of the treatment the vesical mucosa was perfectly white and entire, but much thickened and wrinkled.

Contraction of the bladder, with a consequent diminution of capacity and distressing frequency of urination, is often seen in women, usually originating in a nervous habit of frequent urination, but sometimes the result of cystitis, of inflammatory adhesions around the bladder, and of an anterior fixation of the uterus The diagnosis is made by injection of measured quantities of water and by cystoscopy. The capacity of the bladder may be reduced to an ounce or two, as is demonstrated if water is allowed to flow through a rubber tube attached to a funnel at a height of a foot above the bladder. Cystoscopy shows a wrinkled and corrugated mucosa. The treatment is daily injections of increasing quantities of water, beginning with a small amount and very gradually increasing it so as to avoid unnecessarily hurting and discouraging the patient. She can co-operate with the physician by resolutely increasing the intervals between urinations from day to day, if only by five minutes.

Neoplasms of the Female Bladder.—Neoplasms of the bladder are most commonly *papillomatous polyps*, although, like all tumors of the bladder, they are rare. The tumor is usually pedunculated, grows very slowly, and occasionally reaches a large size. There is profuse hemorrhage, which is the chief clinical symptom, a tendency to recurrence and to carcinomatous degeneration. The growth is not essentially malignant, but can scarcely be called benign.

Carcinoma of the bladder is usually an extension of carcinoma of the cervix uteri. It can, however, occur primarily in the vesical wall as a submucous thickening followed by surrounding nodes, and eventually ulceration. The symptoms are at first vesical tenesmus and pyuria; later hematuria, foul-smelling urine, infection of the ureters and of the pelves of the kidneys.

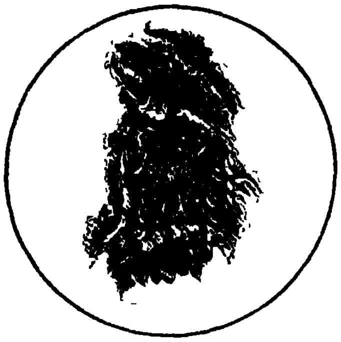

Fig 460 —Papillomatous polyp of the bladder (Viertel).

Mucous polyps occur mainly in children and young girls, grow rapidly, reach a large size, and may protrude from the external meatus of the urethra.

Adenoma, myoma, dermoid, and sarcoma[1] of the bladder have been described The rupture of a vesical dermoid into the bladder and discharge of hair (trichiasis vesicæ) suggest the opening of an ovarian dermoid (ovulogenous cyst) into the bladder Hysterical women have been known to put hair into their urine to excite sympathy and interest

The most distinctive *symptom* of neoplasms in the bladder is hematuria. Pain may be absent. Tenesmus, pyuria, and sudden interruption of the stream of urine may be observed.

Palpation of the bladder in a bimanual examination may reveal a tumor in it, but the growth may be so soft that it is imperceptible. A catheter may remove a small piece of the growth in its fenestra. Palpation of the bladder by the insertion of the little finger through the urethra or by the insertion of a finger through an exploratory incision in the vesicovaginal septum is permissible, but the *diagnosis* is best made by cystoscopy.

The *treatment* is the removal of the growth by a wire snare through the urethra, by an incision through the vesicovaginal septum, or by a suprapubic cystotomy. In a vaginal cystotomy the knee-chest posture is an advantage. The best method is the suprapubic cystotomy in the Trendelenburg posture. A transverse incision is made just above the symphysis, the bladder is pushed up into the wound by a sound in it; a transverse incision is made in the vertex, and its edges seized with hemostats. The tumor is removed by scissors, the knife, a curet, the electrocautery knife, or a Paquelin cautery, the pedicle, if possible, being ligated. The insertion of the urethroscope lamp on its slender stem is often a valuable aid in the intravesical manipulations If the hemorrhage is uncontrollable the bladder and vagina are both packed and additional pressure is made by a firm abdominal binder, a fenestrated rubber tube being placed in the bladder with one end projecting from the urethra and the other through the abdominal wound. Through this tube the bladder may be irrigated with boracic acid or astringent solutions. The packing is removed in twenty-four or forty-eight hours. The tube remains in place for some time, until the abdominal wound cicatrizes The extirpation of the bladder wholly or in part for malignant disease and the implantation of the ureters in the vagina, the urethra, the external skin, or in the rectum has been proposed and carried out, but the results so far have not been satisfactory. Ureteritis and nephritis probably follow even if the immediate results of the operation are good. Implantation in the vagina is preferable to implantation in the rectum, which is always followed by an ascending infection of the ureters

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[1] I had the opportunity of seeing an interesting case of the kind in the service of my colleague, Dr John B. Shober. The tumor projected into the bladder, penetrated its wall, and was attached to the periosteum of the horizontal ramus of the pubis.

Vesical calculus in the female deserves no special consideration except for its extreme rarity[1] and the possibility of an easy removal through a vesicovaginal incision. The symptoms are the same in both sexes and the diagnosis is made in the same way—by cystoscopy and by a metal sound A bimanual vaginal-abdominal examination may be practicable in the female as a means of diagnosis, but cystoscopy, so easily carried out in women, should always precede an operation for stone in the bladder.

Urinary fistulæ are usually the result of pressure necroses following labor. They are becoming very rare in all civilized countries in which women receive proper attention in parturition. It is a question whether more are not encountered to-day from injuries in gynecological operations, especially in hysterectomy for cancer of the cervix.[2] A neglected pessary sometimes ulcerates through the vesicovaginal septum. Other causes are fractured pelvis, injury of the vagina in attempts at criminal abortion, ulcerations through the vaginal wall of a vesical calculus or of a foreign body inserted in the bladder, injury to the bladder-wall in anterior vaginal fixation of the uterus, anterior colporrhaphy, symphyseotomy or myomectomy, and in obstetrical operations such as the use of blunt hooks, attempts at version, clumsy insertion of the forceps, forcible extraction of the head past a prolapsed cystocele, and craniotomy.

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[1] According to Ultzmann, vesical calculus is 200 times more frequent in men than in women

[2] In the beginning of my practice I saw several vesicovaginal fistulæ a year following labor. Now I do not see one a year.

The fistulæ following pressure-necroses in a prolonged labor are easily avoidable by the proper and timely use of the forceps or by the other obstetrical operations that may be indicated in an insuperably obstructed labor. In more than 10,000 women delivered in the hospital services with which the author is connected there has not been a single urinary fistula following labor.

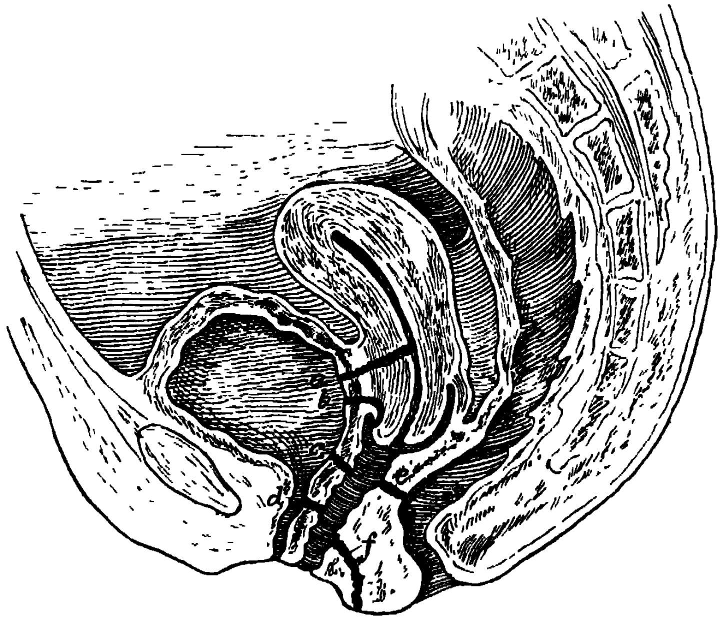

Fig. 461 —Fistulæ of the genital organs: *a*, Vesicouterine fistula; *b*, vesicocervical fistula; *c*, vesicovaginal fistula; *d*, urethrovaginal fistula, *e*, rectovaginal fistula; *f*, perineovaginal fistula (Beigel).

Urinary fistulæ may be classified as follows: vesicovaginal fistulæ; vesicovestibular fistulæ; uterovesicovaginal fistulæ: (*a*) superficial, through the anterior lip of the cervix, which forms the upper wall of the sinus; (*b*) deep, through the uterine wall, the anterior lip of the cervix having sloughed off; uterovesical fistulæ; urethral fistulæ; enterovesical fistulæ; colovesical fistulæ; ureterovaginal and uterine fistulæ.

The opening into the bladder varies in size and shape from a pin-point orifice to a defect of the whole base of the bladder, and from a round hole, regular as if punched out with an instrument, to a jagged opening usually running across the vagina, with offshoots running up the anterior sulci, or in the median line. The vesical mucosa of the vertex may prolapse through a large opening. Irritated by discharges and attrition, it becomes hypertrophied and inflamed.

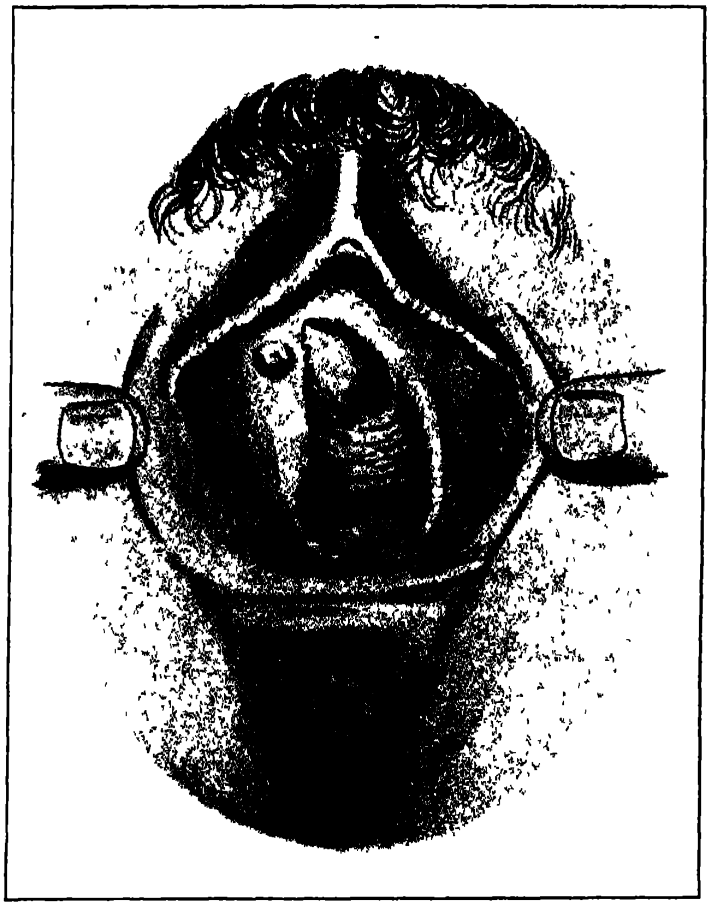

Fig. 462.—Vesicovaginal fistula.

The urethra is often wanting in its upper part and its canal may be obliterated.

Uterovesical fistulæ are usually situated in the anterior lip of the cervix, near the internal os. They are usually on the left side of the median line and are small in caliber.

Enterovesical fistulæ are exceedingly rare. Fritsch[1] in his enormous experience has seen but a single case.

Colovesical fistulæ are more common. They are usually the result of a pelvic abscess which opens both into the bowel and into the bladder.

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[1] Fritsch operated on 200 urinary fistulæ in ten years. "Handbuch der Gyn.," vol ii, p. 84.

Ureteral fistulæ more frequently follow gynecological operations than labor. They are naturally small in size and are usually situated in the vaginal vault, though they may empty into the uterus

Diagnosis.—It is usually easy to recognize a vesicovaginal fistula. There is incontinence of urine and the orifice in the vesicovaginal septum is visible by the aid of a Sims' speculum. If the fistula is small, a uterine sound introduced in the bladder may be made to emerge from the orifice in the vagina, or the sound being held in the bladder, a surgeon's probe may be inserted into every suspicious-looking depression in the anterior vaginal wall until the communication is discovered and the two instruments grate on one another. Colored fluid (a weak permanganate solution or sterilized milk) may be injected in the bladder and will be seen oozing out of a small opening on the anterior vaginal wall

A cervical fistula may be detected by separating the lips of the cervix and inspection, by the tip of an intravesical sound protruding into the cervical canal, or by injecting the bladder and seeing the fluid emerge from the cervix, which is exposed by a bivalve vaginal speculum

A ureteral fistula may be recognized by the fact that part of the urine is voided naturally while part constantly dribbles away; by sounding with a metal ureteral catheter every little indentation in the vaginal vault or cervical canal until the ureter is catheterized and the urine flows from the lower end of the catheter drop by drop or by administering methyl blue by the mouth, draining the bladder with a rubber tube, and packing the vagina tightly with gauze. If there is a ureteral fistula the deepest portion of the packing will be most intensely stained.

An enterovesical or a colovesical fistula is recognized by a microscopical examination of the urine, which shows food particles and feces. "A fecal odor to the urine is not always present and does not always denote a communication with the bowel" (Fritsch). An ingenious method of diagnosticating these fistulæ was demonstrated by Noble after Senn had discovered the hydrogen gas test for fecal fistulæ. A catheter was inserted in the urethra, the bowel was inflated with hydrogen, and the gas was ignited as it escaped from the end of the catheter.

Treatment.—There is always a chance of a vesicovaginal fistula healing spontaneously. According to Fritsch, there are three methods by which a spontaneous cure is effected: First, by granulation tissue filling the opening and eventually closing it. This result is favored by irrigation of the vagina to keep it clean, by draining the bladder after the fifth day postpartum with a Skene's catheter or rubber tube, and by touching the edges of the fistula with a little nitric acid to promote exuberant granulation, although the application of the caustic had better be omitted if the case is apparently pursuing a favorable course. Second, by an inflammatory infiltration and swelling of the vaginal walls, which approximate the edges of the fistula and keep them close together until union is secured; and, third, by cicatrization, which in the course of three months may close an opening as large as a silver dollar.

The operative treatment should be postponed until at least three months after labor, to allow for the chance of spontaneous closure, to obtain firmer tissue for the plastic surgery, and to secure as great a contraction of the fistula as possible.

The vagina, bladder, and vulva should be rendered as healthy as possible by sitz-baths and irrigations with boracic acid and weak permanganate solutions. If the fistula is caused by a foreign body, such as an embedded pessary or a stone, sufficient time must be allowed after its removal to secure a complete healing over of ulcerated surfaces and a cessation of purulent discharge.

General anesthesia is usually required Local anesthesia is not to be recommended.

The dorsal position, with raised buttocks and limbs fixed in leg holders and stirrups, is most suitable for the majority of cases. In fistulæ deep within the genital canal, Sims' position or the knee-chest posture may be necessary. For the latter a specially constructed wedge-shaped cushion is the most convenient and safest support. Etherization is perfectly possible in this position. Sims' specula with blades of varying length and breadth and lateral vaginal retractors, scissors, curved on the flat, sharp pointed, with thin blades; knives set at an angle on the shaft, as well as an ordinary narrow-bladed scalpel; bullet-forceps; two Ulrich's tenacula and single tenacula; a rat-toothed tissue forceps; a needle holder and assorted needles, most of which should be full curved, round-pointed, and delicate, and some of which should have the fish-hook curve, are the instruments required. The suture material should be silkworm-gut, formalin catgut, and fine silk. The last is recommended most highly by

Fig 463 — Ulrich's tenaculum.

Fritsch, whose experience with these operations is greater than that of any other surgeon.[1] The field of operation is exposed by pulling down the cervix with a strong silk ligature, transfixing its lips at a sufficient height above the external os to prevent the ligature cutting out (1 centimeter); by vaginal retractors or by fixing the labia with bullet forceps and pulling them apart. It is occasionally necessary to dilate the vaginal canal narrowed by cicatrization, and to cut, stretch, or tear cicatricial bands obstructing access to the fistula. The shape and extent of the denudation are governed by the situation and extent of the fistula. The length of the wound should, if possible, run across the vagina, as the vaginal walls are more easily approximated from above downward than transversely. For small fistulæ a long linear incision having the fistula as its mid point, with a broad denuded surface secured by a flap-splitting dissection, is the best. For larger fistulæ the denudation represented in figures 465 and 466 is preferable. The breadth of the denudation should never be less than 1 to 2 centimeters. If one edge of the fistula is adherent to the pubis or so fixed by cicatrices that it is immobile, a thick flap may be prepared from the vaginal wall with a broad base, with the least torsion of the

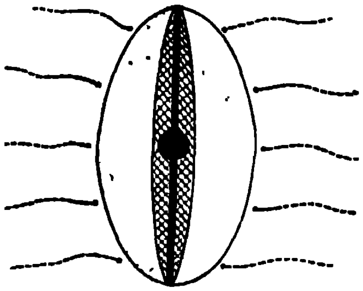

Fig. 464.—Denudation for a small fistula (Fritsch).

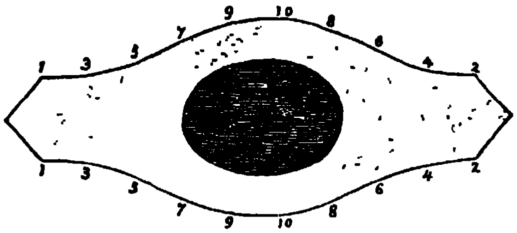

Fig. 465.—Denudation for fistula with tension on the edges of the wound (Fritsch).

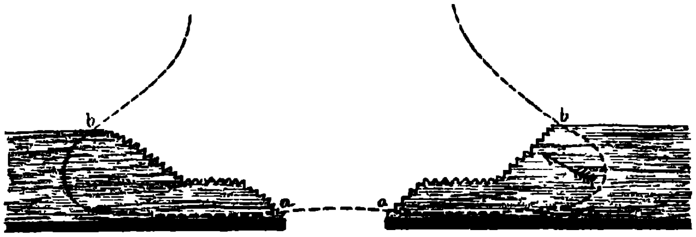

Fig. 466.—Insertion of the suture after the denudation: *a*, *a*, Suture just above the vesical mucosa; *b*, *b*, suture emerging in the vagina (Fritsch).

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[1] I have usually employed a double tier running suture of catgut, reinforced by interrupted sutures of silkworm-gut, shotted.

pedicle possible, and larger in all its dimensions than the denuded surface it is designed to cover. The flap is fixed by buried sutures of fine catgut, the edges of the mucosa being united by superficial stitches of silk or silkworm-gut. A flap may be prepared by a semicircular incision with its base alongside the fistula; it is turned on its base so that the vaginal mucous surface projects into the bladder; after the edges are fixed by fine catgut in the denuded edges of the fistula, the raw surface is covered by the approximation of the vaginal mucous membrane surrounding it (Martin).

Ferguson proposes a circular incision around the fistula 3 to 6 millimeters from its margin, down to the vesical wall. The vaginal flap is dissected loose, turned inward, and its free edges united with fine formalin gut, thus closing the fistula. The raw surfaces left in the vagina are approximated by interrupted sutures.

It may be impracticable to close a large, irregularly shaped fistula at one sitting. The most easily approximated edges are united at one operation and the remainder of the opening is closed subsequently.

The anterior lip of the cervix may be used as a plug to cover in a considerable defect in the bladder-wall. The author has thus closed a fistula admitting four fingers, due to the ulceration of a neglected pessary through the vesicovaginal septum The lateral extremities of the fistula were closed in the ordinary way and the denuded vaginal portion of the cervix was fastened in the center of the wound, where a defect existed too extensive to be covered by vaginal flaps.

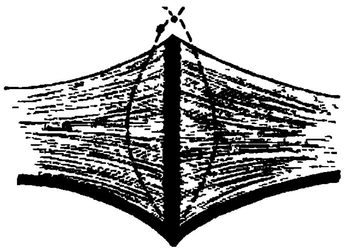
Fig. 467 —Apposition when the denudation is properly made and the suture correctly inserted (Fritsch).

In closing fistulæ running a considerable distance transversely, care must be exercised to locate the ureteral orifices which otherwise might be buried in the denuded surface or occluded by a suture.

In suturing a denuded area around or a transplanted flap over a vesical fistula, the needle must not penetrate the vesical mucosa. If it does, an intravesical hemorrhage will probably result in a failure of the operation or the suture tract may develop into another fistula. Acquired atresia of the vagina is a method of spontaneous cure not infrequently seen. If the patient has passed the menopause, she remains comfortable, but if she menstruates into the bladder, there may be severe distress at the periods;[1] and if the lower portion only of the vaginal canal is closed, a sac exists beneath the level of the fistula in which blood, pus, and decomposed urine collect. It is occasionally impossible to close a serious defect in the posterior wall and base of the bladder. In such cases a *colpocleisis* is justifiable, if the precaution is taken to close the canal up to the level of the fistula, leaving no vaginal sac below for the retention of decomposed urine and menstrual discharge.

Fritsch has closed a fistula by denuding the anterior surface of the posterior lip of the cervix in a case of defect of the anterior lip and implanting the posterior lip in the vesical opening The woman menstruated into the bladder, but remained comfortable for years.

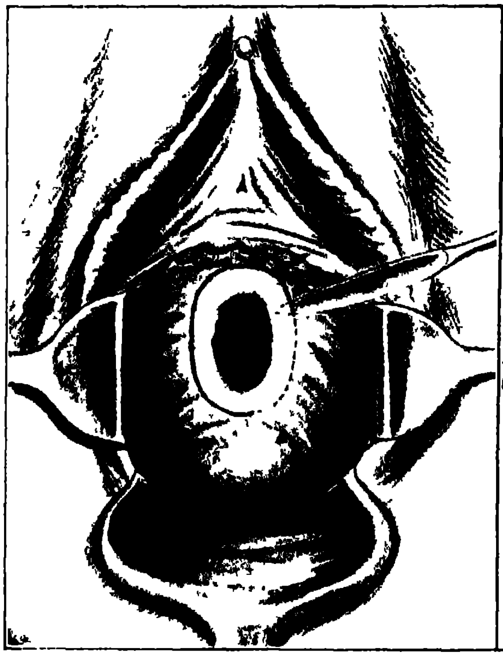

Fig 468 —Flap-formation as suggested by Ferguson.

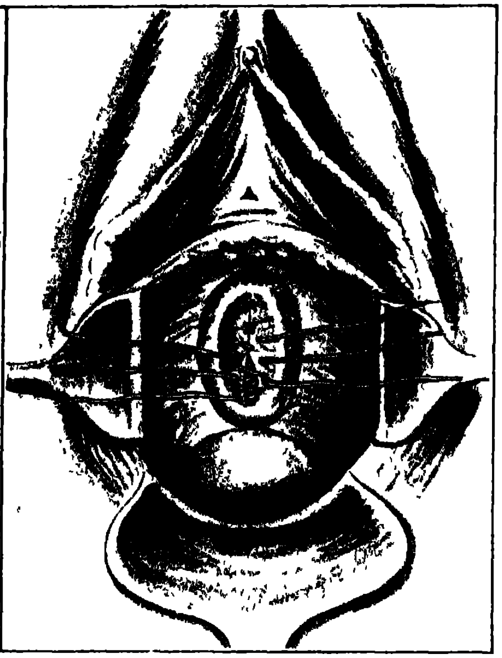

Fig. 469 —Flap turned in and vesical opening closed

To close the vagina (colpocleisis), a circular denudation is made around the whole canal 2 centimeters broad, at a sufficient height to preclude the formation of a sac below the level of the fistula; a row of interrupted sutures across the vagina, inserted from before backward, closes the canal. In difficult cases of extensive fistulæ deep within the vagina, and of fixation of the bladder by cicatricial adhesions, the following procedures have been advocated and adopted:

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[1] I have at present under observation a case of the kind: vesicovaginal fistula, acquired atresia of the vagina, a retroflexed and fixed uterus with salpingo-oophoritis There is menorrhagia and severe dysmenorrhea due to the passage of clots from the urethra. I intend to perform hysterectomy.

Incision into the anterior bladder-wall by suprapubic cystotomy in the Trendelenburg posture and closure of the fistula from above, silk ligatures, if they are used, being left long and led out of the urethra, whence they are removed by traction after they have cut through the tissue; or buried catgut sutures may be employed (Trendelenburg).

A transverse incision over the pubis, freeing the bladder, and closure of the fistula from the vagina (Fritsch).

Separation of the vagina from the bladder around the fistula, closure of the opening in the bladder, and a separate closure of the vaginal wound as in anterior colporrhaphy (Winternitz, Mackenrodt).

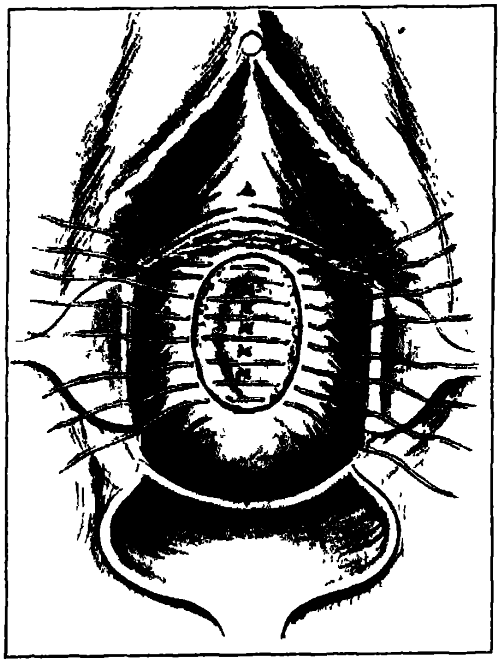

Fig 470.—The vesical opening closed and sutures inserted to unite the vaginal walls

Opening Douglas's pouch, retroverting the uterus into the vagina, using its posterior surface (which becomes anterior in the complete retroversion) as a plug to fill in a large defect in the vesicovaginal septum, and making an artificial os in the fundus to allow the escape of menstrual discharge (Freund).

If the urethra is absent or partly destroyed, its restoration is always doubtful. The most hopeful plan is to prepare a flap of mucous membrane as thick as possible from one side, to turn it inward so as to bring the mucous surface within the newly made canal, and to fasten it in a denuded area on the opposite side. The new urethra should be established before the vesical fistula is closed.

Fortunately, continence may be established without the presence of a urethra, by leaving a narrow orifice at the neck of the bladder. This was accomplished in one of the author's cases after several futile attempts to construct a new urethra, which was entirely lacking directly back of the external meatus.

If there is such a serious defect of urethra and base of bladder that no plastic operation succeeds in restoring even partial continence, colpocleisis and a rectovaginal fistula may make the patient's condition endurable. But if there is a cystitis at the time of operation, the result may be fatal from an exacerbation of the inflammation and infection of the ureters and kidneys. Indeed, there is always danger after such an operation of pyelonephritis, though occasionally, as in one of Fritsch's cases, the patient remains comfortable and well for years

The rectovaginal fistula, admitting a forefinger, should be made by a transverse incision just above the sphincter ani, the vaginal and rectal mucous membranes being united by interrupted sutures of catgut. The vaginal orifice is then closed. A double rubber drainage-tube is inserted through the fistula, and during the patient's convalescence the vesicovaginal pouch is frequently irrigated with a boracic acid solution

The most important question to decide in the *after-treatment* of a vesicovaginal fistula operation is whether to resort to drainage of the bladder or to catheterization. After trying both plans, I prefer catheterization every four hours; but Fritsch, from a much larger experience, unreservedly recommends drainage by the following plan: After the operation, the bladder is injected with water to test its impermeability A rubber tube is then inserted in the urethra until the water flows out—that is, until its end just passes the internal sphincter. This tube is fastened to the mucous membrane of the external meatus by a few fine sutures and is long enough to be led into a vessel between the patient's knees. Skene's retention catheter is likely to get stopped up and to prove an irritant to the bladder, so that the rubber tubing is preferable.

The vagina is lightly packed with iodoform gauze. The tube and the packing are removed on the seventh or eighth day and at the same time the stitches are removed, or, if fine silk has been used, they may be left to come away of themselves.

If a ureter has been included in one of the stitches, there are the symptoms of deficient urinary secretion, rapid pulse, pain in the back, a tendency to somnolence, and sometimes, though rarely, high fever. There are two courses open to the operator: one is to remove the stitches and to do the operation over again; the other is to trust to nature to overcome the difficulty, which is often done by the stitch cutting through, by the urine under pressure forcing its way through the loop of the ligature, or by the establishment of a ureterovaginal fistula. Occasionally the kidney on the affected side atrophies and the remaining kidney performs the work of two, as after a nephrectomy.

If there is a persistence of incontinence after the operation, the flow of urine may come from a suture track, from a failure of union at some part of the wound, or from a second fistula not detected at the time of the operation. The last two conditions require subsequent operations. A small suture track fistula often closes spontaneously, and some time should be allowed for this result before subjecting the patient to a second operation, which might be unnecessary

Intravesical hemorrhage will not occur after an operation for vesicovaginal fistula if the sutures are properly placed. If it does, it is an awkward complication. The bladder should be washed out with boracic acid solution every two hours to prevent the formation of a large clot. If a clot does form in the bladder, causing tenesmus, the injection of pepsin solution has been recommended to soften it.

The Treatment of Ureteral Fistulæ and of Surgical Injuries of the Ureters.—There are three kinds of surgical treatment for ureteral fistulæ: nephrectomy; a plastic operation in the vagina (*colpo-uretero-cystostomy*, or *ureteral anastomosis*), and an abdominal section followed by the junction of the ureter (*celio-uretero-ureterostomy*) or its implantation in the bladder (*celio-uretero-cystostomy*)

A nephrectomy is often the easiest way to remove the disagreeable symptoms of a ureteral fistula, but it cannot be called the ideal operation. There must always be some doubt as to the adequacy of the remaining kidney, and the natural impulse is to avoid the removal of such an important organ unless it is itself diseased. It must be admitted, however, that the operation has been repeatedly performed with success Several of the women [1] have subsequently been delivered at term without the slightest disturbance of health. As in nephrectomies for any indication, the most scrupulously careful examination should be made of the secretion from the remaining kidney, by catheterizing the ureter or by vesical segregators (Harris' or Cathelin's). If the kidney corresponding to the ureteral fistula shows evidence of pyelonephritis or hydronephrosis there is additional justification for its removal, but it should be remembered that both of these conditions have disappeared after the fistula has been closed by vaginal or abdominal operations.

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[1] Fritsch reports 3 cases (*loc. cit.*).

Nephrectomy should in general be limited to those cases in which the closure of the fistula has proved impracticable by both the vaginal and abdominal routes or in which there is marked hydronephrosis or pyelitis

The operation may be performed by a lumbar incision or by the transperitoneal method. The latter is often easier for the surgeon, but may not be so safe for the patient. There is no necessity for the exsection of the ureter, and there need be no fear of the regurgitation of urine from its lower fragment. If the transperitoneal operation is selected, the incision should be made laterally through the abdominal wall directly over the kidney. The posterior parietal layer of the peritoneum is opened, the kidney delivered, and its pedicle (blood-vessels and ureter) is tied with silk or catgut by passing a pedicle needle through its middle, tying in both directions, and then back again around the whole stump. This step in the operation is usually easier in the transperitoneal than in the lumbar operation. Both layers of peritoneum are closed.

The steps of the lumbar operation are the same as those of nephrorrhaphy, to be described later.

The lumbar incision should always be preferred if there is pyelonephritis or perinephritis, or if the most perfect aseptic technic is impracticable. Many operators accustomed to nephrorrhaphy by this method prefer it uniformly.

The Vaginal Operations for Ureteral Fistula.—The first requisite for a successful plastic operation by the vagina is to find the upper end of the ureter and its orifice, which it is not always easy to do. If there is not too much scar-tissue, the ureter may be dissected out, implanted into an incision made into the bladder, and fastened in place by several interrupted sutures of fine catgut. The vaginal wound is closed over the end of the ureter and the opening in the bladder into which it has been implanted (Parvin, McArthur) It has sometimes been possible to sew the mucous membrane of the bladder to the mucous membrane of the ureter and so to fasten the latter in place. The vaginal mucosa, dissected back on each side by a flap-splitting dissection, is united over the ureter and the newly made opening into the bladder.

Schede's operation has given on the whole the best results : a vesicovaginal fistula is made close by the ureteral fistula, the mucous membrane of the bladder and that of the vagina being united by interrupted sutures of catgut ; an oval denudation is made 1 centimeter wide around both the ureteral and the vesical fistula, leaving a strip of undenuded membrane 0.5 centimeter wide immediately surrounding both fistulæ. The denuded surfaces are united by interrupted sutures, thus directing the stream of urine from the ureter into the bladder.

Bandl's operation is only practicable if both ends of the ureter are discoverable and are normally patent. A ureteral catheter is passed into both the lower and the upper segments of the ureter, emerging from the urethra A denudation is made and united as in Schede's operation, but without making a vesicovaginal fistula. If the catheter is fenestrated, the whole bladder is drained by it, or the urethra may be drained by a rubber tube through which the ureteral catheter passes.

Mackenrodt's operation is very ingenious and has been successful in the few cases in which it was tried. A vesicovaginal fistula is made near the ureteral fistula. A semicircular thick flap of vaginal mucosa is dissected off, so that it carries the ureteral opening in its center, has its attached base next to the vesicovaginal fistula, and its free edge away from it. By turning this flap over a half circle on its base it closes the vesicovaginal fistula like a lid ; it is sewed in place by catgut sutures, with the vaginal mucous membrane looking into the bladder and so turning the ureteral fistula into the bladder. The raw surfaces left by the removal of the flap and over the vesicovaginal fistula are united with interrupted sutures, or are allowed to granulate.

Dudley's Operation, as Reynolds [1] says, is a crude procedure, but has succeeded when other plans have failed. A sharp-pointed artery or other similar forceps is passed into the urethra ; a vesicovaginal opening is made ; one blade of the forceps, which is opened for the purpose, is pushed out of the incision in the bladder ; the renal end of the ureter is threaded on it ; the handles of the instrument are closed and tied, thus clamping the end of the ureter to the bladder-wall. The forceps is lightly pulled upon after eight or ten days. If it does not come away it is opened and extracted.

The Abdominal Operation for Ureteral Fistula or Injury.—If the ureter is injured during an operation, it may be repaired in several ways : If the incision is linear or fails to sever the ureter completely, the wound may be repaired by fine catgut sutures, mattress or interrupted, with considerable certainty of success If the ureter is completely severed, is fenestrated or badly crushed, as by clamp forceps, it may be re-joined by an end-to-end anastomosis (Tauffer, Bovee) ; by an end-to-end (Poggi) ro a lateral invagination (Van Hook's uretero-ureterostomy) ; or by a lateral anastomosis. In the first, a section of a ureteral catheter

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[1] "Boston Med and Surg. Jour ," 1901, p. 84

is passed into both segments of the ureter, with a silk ligature tied around its middle, to recover it by, if it should slip down the lower portion of the canal. Interrupted sutures of fine silk or formalin catgut are passed through the walls of the two ends of the ureter; before the knots are tied, the catheter is withdrawn.

Van Hook's lateral invagination is the most reliable operation. The upper end of the lower segment of the ureter is ligated, a linear incision is made through its wall below the ligature twice as long as the diameter of the ureter; the upper segment is implanted into this incision and is fastened by fine sutures at both ends of the wound; the edges of the incision are then carefully sewed to the ureteral wall passing between them, so that the opening is securely closed. Bovee in 1897 collected 12 cases of ureteral anastomosis. If a junction of the two ends of a severed ureter is impossible, as in a case of old injury, extensive destruction of tissue, or the removal of a considerable portion of the ureter in the wall of a cyst or a fibroid tumor, *implantation of the upper segment into bladder* (celio-uretero-cystostomy) is necessary. This may be done by a transperitoneal or an extraperitoneal operation. In the former the peritoneum over the ureter is incised, usually in the neighborhood of the bifurcation of the iliac arteries; the ureter is dissected free, care being taken not to isolate it too extensively, on account of danger to its nutrition. An incision is made into any portion of the bladder-wall, which the ureter reaches without tension; the end of the ureter is inserted into the opening so that it projects somewhat into the bladder; the edges of the wound in the latter are carefully sewed to the wall of the ureter by interrupted or mattress sutures, and its angles are closed by separate sutures. Penrose recommends splitting the end of the ureter, putting a mattress suture in each lip, and passing each end of the mattress sutures, rethreaded on a fine needle, through the bladder-wall, tying them on the peritoneal surface of the bladder. This plan prevents occlusion of the ureteral orifice and precludes the ureter slipping out of the bladder.

There are disadvantages in the transperitoneal operation. Failure may mean fatal peritonitis, in spite of drainage; and the band of isolated ureter traversing the pelvic and lower abdominal cavities may cause intestinal complications.

The extraperitoneal operation is the ideal one, if it is practicable. The implantation of the ureter in the bladder by a vaginal operation has been described (p. 552). In an abdominal operation it may be possible to reach the upper segment by incising the anterior layer of the broad ligament and the vesico-uterine pouch and to implant the ureter under the peritoneal covering of the latter.

Witzel proposes to free the ureter as in the transperitoneal operation, carrying its end by forceps around the brim of the pelvis under the peritoneum and bringing it forward above the anterior parietal peritoneum. Both incisions in the peritoneum are closed and the operation is concluded extraperitoneally by implantation of the ureter in the bladder, the ureter being cut obliquely so that its end is a point, the bladder being incised obliquely so that the implanted ureter runs some distance in its wall. It is necessary to fasten the bladder-wall to the pelvic connective tissue by catgut sutures to avoid tension on the implanted ureter. Mackinrodt modifies this procedure by making his abdominal incision at the outer edge of a rectus muscle; separating the peritoneum to the bifurcation of the iliac artery, bringing the end of the ureter forward above the peritoneum, puncturing the bladder from within by a trocar, and drawing the end of the ureter into it. If the ureter is so much shortened that its upper portion can not be made to reach the bladder without too much tension, the following ingenious plans have been proposed to splice it: The two ends of the ureter are brought out on the abdominal skin and fastened there, after the wound has healed, a tube of skin is made between the two ureteral orifices by parallel incisions, and uniting the free edges of the skin; the tube is depressed and covered over by uniting the outer edges of the parallel incisions (Rydygier). A diverticulum is constructed from the anterior bladder-wall, into which the upper end of the ureter is implanted (Van Hook, Boari, Casati). The ureter is spliced by a hollow, decalcified turkey's-wing bone sewed in the ureter and the bladder (Van Hook). The ureter is spliced by a segment of small intestine, separated from the bowel which is joined by an end-to-end anastomosis; the segment of gut is left attached to its mesentery and is closed by sutures at both ends. The two ends of the ureter are implanted in the segment of bowel (Bacon). The appendix is used to splice the ureter (Giannettasio). The ureter is implanted in the Fallopian tube (D'Urso and Fabii). These propositions have been theoretical or else the result of experiments on dogs.[1]

As in all intra-abdominal operations on the ureters and bladder, the Trendelenburg posture is essential, and gauze drainage afterward is necessary in case the closure of the bladder or junction of the ureters proves imperfect.

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[1] Henry Morris, "Surgical Diseases of the Kidney and Ureter," vol ii, p. 608, and Nicholson, "Treatment of Severed Ureters," "Amer Jour. Med Sci.," April, 1902.

MALFORMATIONS AND DISEASES OF THE URETHRA.

Total Defect of the Urethra.—As the result of arrested development the urethra is absent. The neck of the bladder may also be absent, the vagina and bladder being a common canal. There may be defective development, also, of the clitoris and nymphæ.

Partial Defect of the Urethra.—The lower portion of the urethra may be absent (hypospadias); sometimes only the lower wall, sometimes the whole canal in its lower part. There may be a defect in the upper part of the lower urethral wall just below the vesical sphincter.

Atresia urethræ usually affects the upper portion. The canal may, however, be closed throughout its whole length.

There may be a **duplicity of the urethral canal,** the external orifices lying side by side, the internal one above the other (Furst).

The **symptom** of urethral malformation is either retention of urine or incontinence. Grave defects are often incompatible with extra-uterine existence. The difficulty in atresia or defect of the urethra is sometimes spontaneously overcome by a patent urachus and the discharge of urine from the umbilicus. In some malformations, such as hypospadias, there may be no symptoms at all. The kind and degree of malformation are recognized by inspection, either direct or through the urethroscope; by palpation, and by the use of a sound.

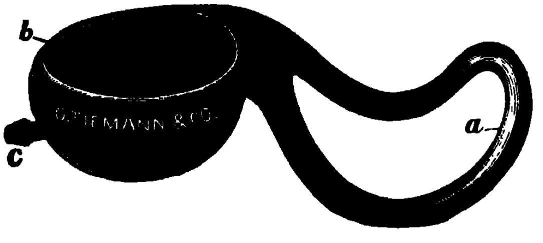

Fig 471—Skene's urinal cup-pessary: *a* represents the posterior portion which surrounds the cervix uteri, *b*, the cup; and *c*, the tube which conveys the urine from the cup to the urinal.

Treatment.—Atresia requires operation The region of the neck of the bladder is punctured with a trocar or is opened by a linear incision, the latter enabling the patient to hold urine better than the former. Sewing the vesical mucous membrane to that of the vagina and the use of bougies are necessary to keep the opening patulous.

The defects of the urethra resulting in incontinence may be remedied by plastic operations such as are required for vesical fistulæ; may be treated by pressure upon the lower vesical wall with a specially constructed instrument on the principle of a globe pessary with external support, or the patient may be made comparatively comfortable with an intravaginal cup, Skene's urinal cup-pessary with a rubber tube attached to a rubber bag fastened around one thigh.

Urethralgia is pain in the urethra without organic disease or anatomical alteration of any kind, except a slightly exaggerated prominence of the papillæ. It occurs in neurotic women and is probably a pure neurosis. Local treatment only serves to fasten the patient's attention on the condition and to aggravate or prolong it. The rest cure, change of air and scene, tonics, exercise in the open air, promise better results than local applications.

Urethritis in the female is almost invariably due to gonorrhea, although it is often difficult or impossible in a chronic case to prove conclusively the specific infection. In consequence of the short length and straight course of the canal, gonorrheal urethritis in the female is of shorter duration and is much less troublesome to the patient than the same affection in the male.

In acute and in many chronic cases pus may be pressed out of the urethra by passing the tip of the forefinger from the neck of the bladder to the external meatus. Gonococci may be present in the pus, but their absence does not exclude the gonorrheal origin of the inflammation. The meatus may be irritated and inflamed, and there may be additional evidence of the specific character of the inflammation in the openings of Skene's glands, the vulvo-vaginal glands and other portions of the genital tract. The urethral mucous membrane seen through the urethroscope is reddened, thickened, and flaked with mucopus, in an acute case. In a chronic inflammation the same appearance is seen in spots separated by healthy mucous membrane. In these cases also granular erosion may be seen here and there or along the whole course of the canal. In posterior urethritis in the female there may be fissures or cracks in the urethral membrane and within the sphincter of the bladder, often hidden in the swollen and reddened mucosa, but displayed as the end of the urethroscope is withdrawn from the bladder.

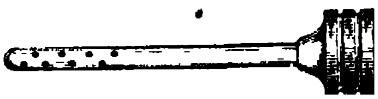

Fig. 472.—Fritsch's urethral canula, to be attached to a hypodermic syringe.

The patient complains of a burning sensation on urination. There may be frequent micturition and vesical tenesmus, but the latter symptoms indicate involvement of the bladder, and are due to cystitis and not to urethritis.

The **treatment** of an acute case is rest in bed; a milk diet; large draughts of water; the administration by the mouth of urotropin (5 grains) and salol (5 grains) alternately every three hours, and the irrigation of the urethra once or twice daily through a Skene's reflux catheter with a 5 per cent. argyrol solution. In chronic cases the ingenuity and patience of the physician may be taxed severely. The following remedies should be tried: Injection into the urethra, by a Fritsch's tube, of argyrol solutions, 20 to 50 per cent.; pure ichthyol; solution of sulphate of zinc, 2 parts, tannin, 0 5 part, water, 500 parts; solutions of ichthargen, 1 : 2000; nitrate of silver solution, 1 : 4000; formalin solution, 1 : 5000; introduction of Finger's ointment (potas. iodid, ʒiss; iodin, gr. xv; ol. oliv., fʒiss; lanolin, ℥iij) by a corrugated sound, washed out after five to ten minutes; slitting up Skene's ducts and several other follicles in their neighborhood with a small knife and destroying their interior with an electrocautery needle after cocainization; applying pure carbolic acid or nitrate of silver solution, ʒj–f℥j to the most inflamed areas or to the whole urethral canal through a urethroscope; introduction of an emulsion of subnitrate of bismuth and castor oil, equal parts; insertion of bacilli of cacao butter impregnated as densely as possible with subgallate of bismuth; dilating the urethra with sounds or the sphincter with the two-branched uterine dilator (for posterior urethritis and fissures). The success of any treatment may demand an artificial vesicovaginal fistula, so that the urethra may be spared the constant irritation of micturition.

Granular erosion of the urethra usually follows a chronic gonorrheal urethritis, though it is said sometimes to arise spontaneously in elderly women. The whole urethra is lined with young columnar epithelium; the papillæ are hypertrophied; the mucous membrane is the color of raw beef, and is extremely sensitive. Urination is very painful. The most successful treatment is cauterization by carbolic acid and nitrate of silver solution, once in eight to ten days; irrigation of the urethra with argyrol solution, 5 per cent., daily, and the use of urethral bacilli impregnated with subgallate of bismuth, inserted after the irrigation. The treatment is much more speedily successful if a vesicovaginal fistula is maintained until the granular erosion is healed.

Stricture of the urethra in the female is not nearly so common as in the male. It usually follows gonorrheal urethritis, though it may be the result of injuries in childbirth, the application of caustics to the canal, cicatricial bands in the vagina, disuse in cases of vesicovaginal fistulæ, or congenital stenosis. The stricture is usually in the upper third of the canal; it may be at the external meatus or at the vesical sphincter.

The **symptoms** are dysuria and frequent urination.

The **diagnosis** is made by passing graduated sounds as in the male urethra.

The **treatment** is gradual dilatation with sounds, dilatation with the two-branched uterine dilator or the division of the stricture by a urethrotome. In cases of obstruction of the urethra due to cicatricial bands in the vagina, these bands should be cut or torn (p. 143), in addition to the passage of sounds in the urethra. Congenital stenosis and contraction from disuse are treated by gradual dilatation with bougies.

Vesico-urethral fissure is a small, linear crack or fissure, in the folds of the mucous membrane at the vesical sphincter, running parallel with the long diameter of the urethra and extending usually for a third of its length into the bladder. As in a fissure *in ano*, the ulcerated surface is constantly teased and compressed by the sphincter muscle around it, causing frequent painful micturition and a constant burning sensation at the neck of the bladder. The fissure is plainly seen through a urethroscope, which is inserted into the bladder and then slowly withdrawn through the sphincter, which closes around the end of the instrument.

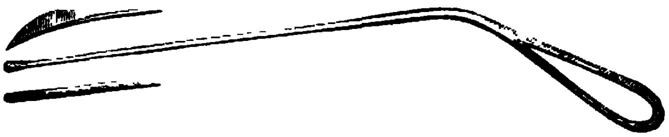

Fig. 473.—Skene's fissure probe and knife.

The condition is usually the result of gonorrheal urethritis, but may be due to the passage of a calculus or to urethritis or cystitis from any cause.

The **treatment** is dilatation of the urethra by a sound three or four sizes larger than one that passes easily, touching the fissure after wiping it off with cotton by a small probe point on which nitrate of silver has been fused, and incising it with Skene's knife. The first two procedures usually suffice.

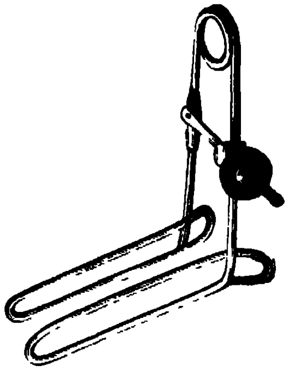

Fig 474.—Skene's modification of Folsom's nasal speculum

Neoplasms of the Urethra.—Condyloma, cysts, myxadenoma, mucous polyp, angioma, varices, phlebectases, fibroma, gumma, sarcoma, and carcinoma of the urethra have been reported. The growths are easily seen through the urethroscope. To determine their nature it may be necessary to remove a piece for microscopical study. Pain, hemorrhage, dysuria, dyspareunia, are the symptoms of urethral growths, with possibly the protrusion of the tumor from the meatus.

Pedunculated tumors are removed by polypus forceps or snares, such as are used in the ear and nose It may be necessary to ligate the pedicle, to touch its base after removal with caustic or the electrocautery point. Small growths may be removed through the cylindrical urethroscope. Large tumors are more conveniently displayed by Skene's urethral speculum. Sessile growths may be exsected, if necessary, after incision of the lower urethral wall or may be destroyed by the electrocautery point. Malignant growths necessitate the excision of a part or of the whole urethra.

Dilatation or dilatability of the urethra is usually a congenital affection. The whole canal may be so dilatable as to permit the insertion of the penis. Copulation has been practised in this manner in a number of reported instances. The dilatation may be confined to a portion of the canal only, most often to the middle third, when the lower wall sags down into a pouch (*sacculated urethra, urethrocele*), from injury in labor to its supporting muscle of the urogenital trigonum.

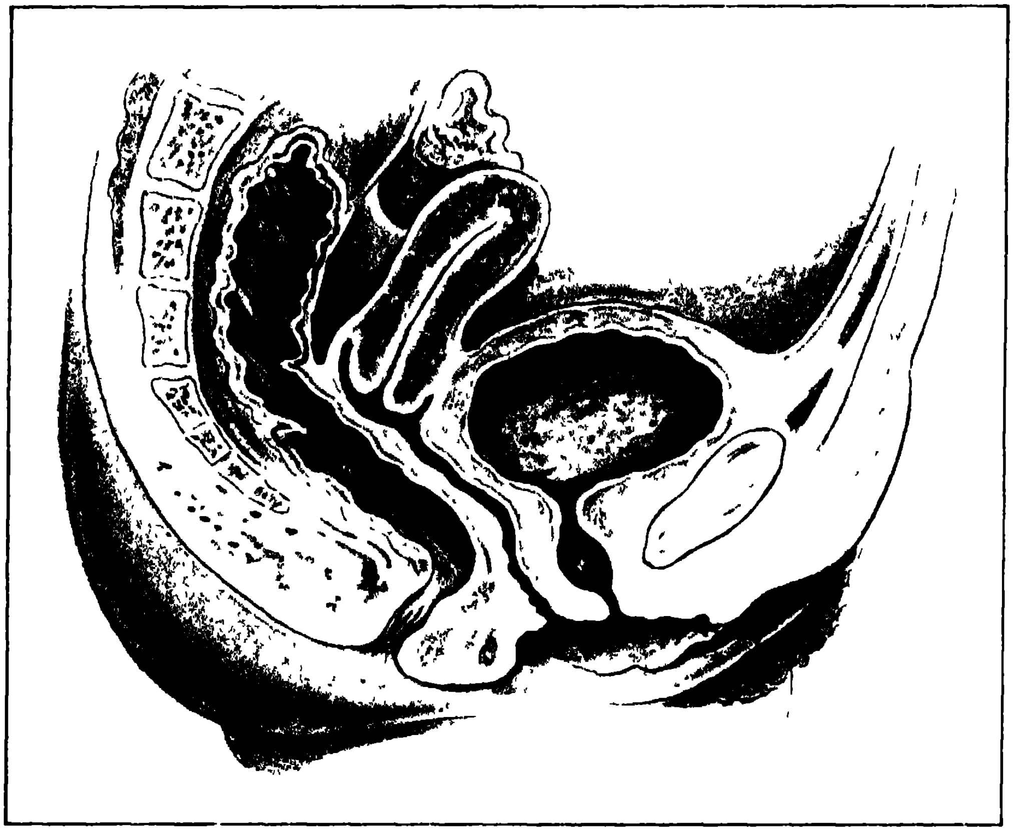

Fig. 475 —Dilatation of middle third of the urethra (urethrocele).

The **symptoms** may be partial incontinence of urine, frequent and painful micturition, or dysuria (in dilatation of the middle third), but extreme dilatability permitting coitus *per urethram* has been observed with perfect continence and without any inconvenience to the patient.

The **diagnosis** can be made by the insertion of sounds or the finger in dilatability of the whole canal, or by the use of a probe in sacculation of the urethra, the point of which can be depressed into the sac and felt through the vaginal wall.

The **treatment**, if any is required, is injection of astringents into the urethra (tannic acid), pressure upon the upper part of the canal by one of the pessaries designed for cystocele, or one of the following operations to narrow the canal: In sacculation of the urethra, the repair of the urogenital trigonum muscle and an oval excision of the redundant urethral wall closed by close-set interrupted or a tier catgut suture; in dilatation of the upper third, a linear incision in the lower urethral wall, excision of

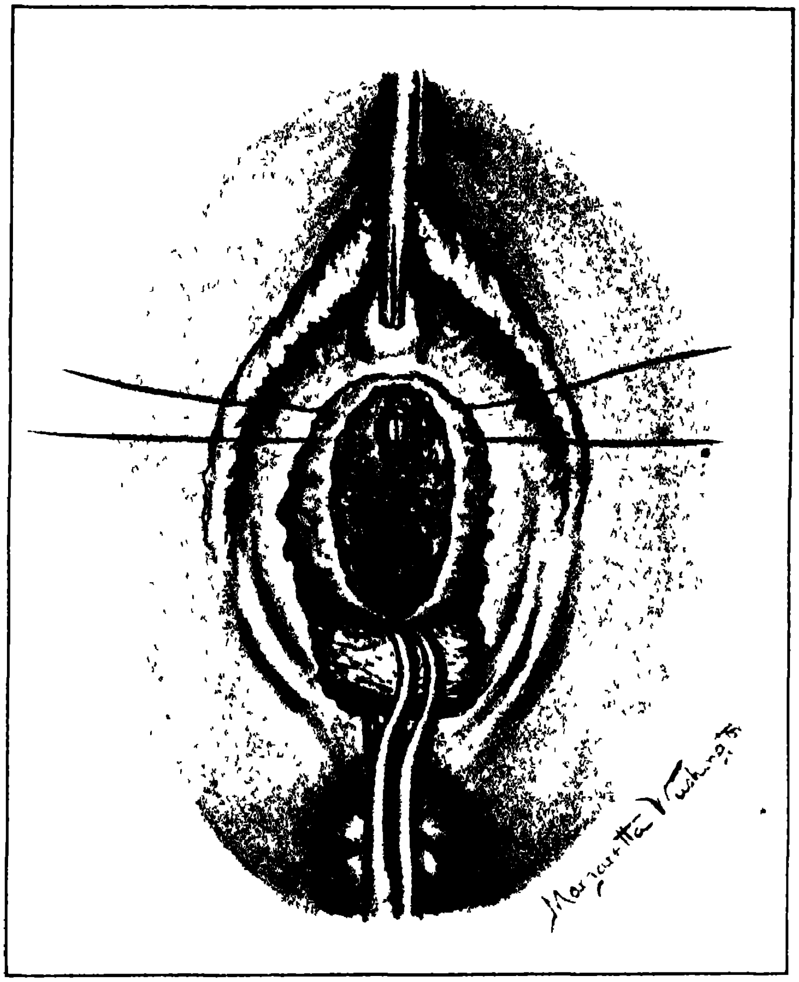

Fig 476 —Operation for dilatation of upper third of urethra and relaxation of the vesical sphincter, complicated by a cystocele Denudation of anterior wall of vagina and excision of lower urethral wall

a part of the urethral walls on both sides, and the junction of the wound with a continuous catgut or interrupted fine silk ligatures; in dilatation of the lower third, excision of two V-shaped pieces of mucous membrane opposite one another, with the bases at the external meatus and the apices within the canal; or drawing a fine cautery point along the urethral mucous membrane, through a speculum, in two or more places equidistant from one another, leaving strips of healthy membrane between.

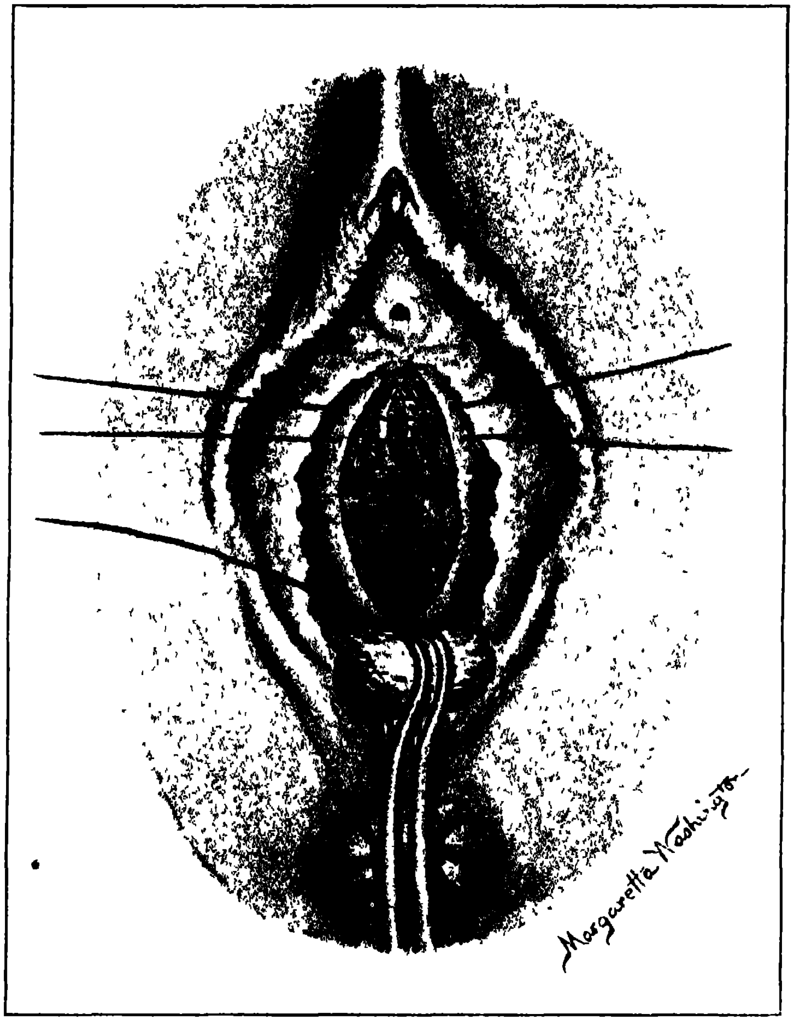

Fig 477 —Insertion of sutures; two of silkworm-gut, to unite the urethra and vesical sphincter. A running tier suture of catgut for the cystocele.

Injections of paraffin and vaselin into the periurethral tissues has been advocated and practised in Germany for urethral dilatation and incontinence Success is reported, but the method is no one that appeals to the author's reason, and it is not free from risk of embolism. (See "Jahresbericht u. d. Jahr 1901," p. 364.)

Displacements of the urethra occur in consequence of injury to the urogenital trigonum muscle, in association with cystocele, inversion of the vagina, and prolapsus uteri. The surgical or mechanical treatment of these conditions restores and maintains the normal position of the urethra.

Prolapse or inversion of the urethral mucous membrane occurs sometimes in young children, but oftener in elderly women. In the former, however, it is usually more exaggerated, the reddened, thickened, and irritated membrane projecting from the vestibule and becoming partially strangulated if the meatus is contracted. In elderly women some prolapsus of the urethral mucous membrane is very common; it is reddened in color or of a purplish hue if, as is often the case, there is phlebectasia. The **causes** are urethritis, cystitis, vesical tenesmus, increased intra-abdominal pressure (straining in labor and a chronic cough), and general debility. It may be inexplicable.

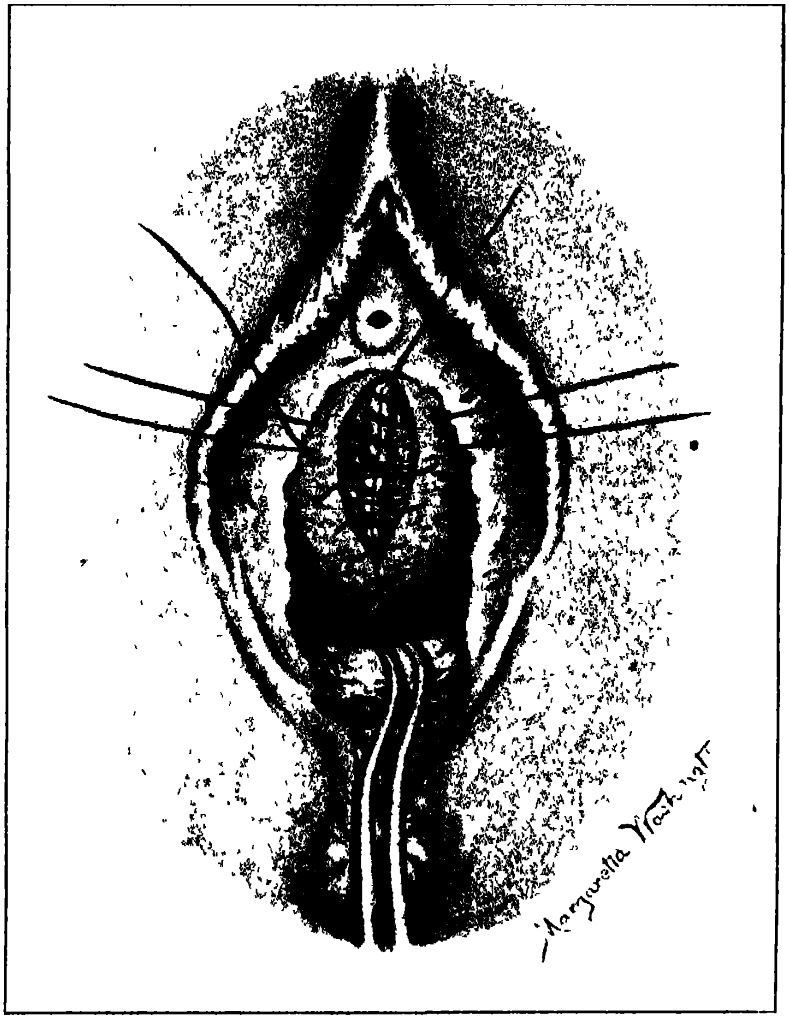

Fig. 478 —The last turn of the tier suture, uniting the edges of the vaginal mucosa. The two silkworm-gut sutures are shotted after the continuous suture is tied

The **symptoms** are a feeling of irritation in the part and a burning sensation on urination.

The **diagnosis** is easily made by inspection, palpation, and the use of a probe. The pouting membrane projects from the meatus; it can be reduced within the urethral canal by taxis, and the orifice of the canal is in the middle of the projecting tumor.

The **treatment** is palliative, medicinal, or radical. It may be possible to relieve the patient's discomfort by replacing the prolapsed mucous membrane, keeping her in bed for a while, and applying astringents, tannic acid, adrenalin solution, or formalin solution There is a very annoying form of irritation of a partially prolapsed urethral mucous membrane in middle-aged and elderly women which is an expression of gout or rheumatism; which yields promptly to the appropriate remedies for those systemic conditions, but resists indefinitely local treatment

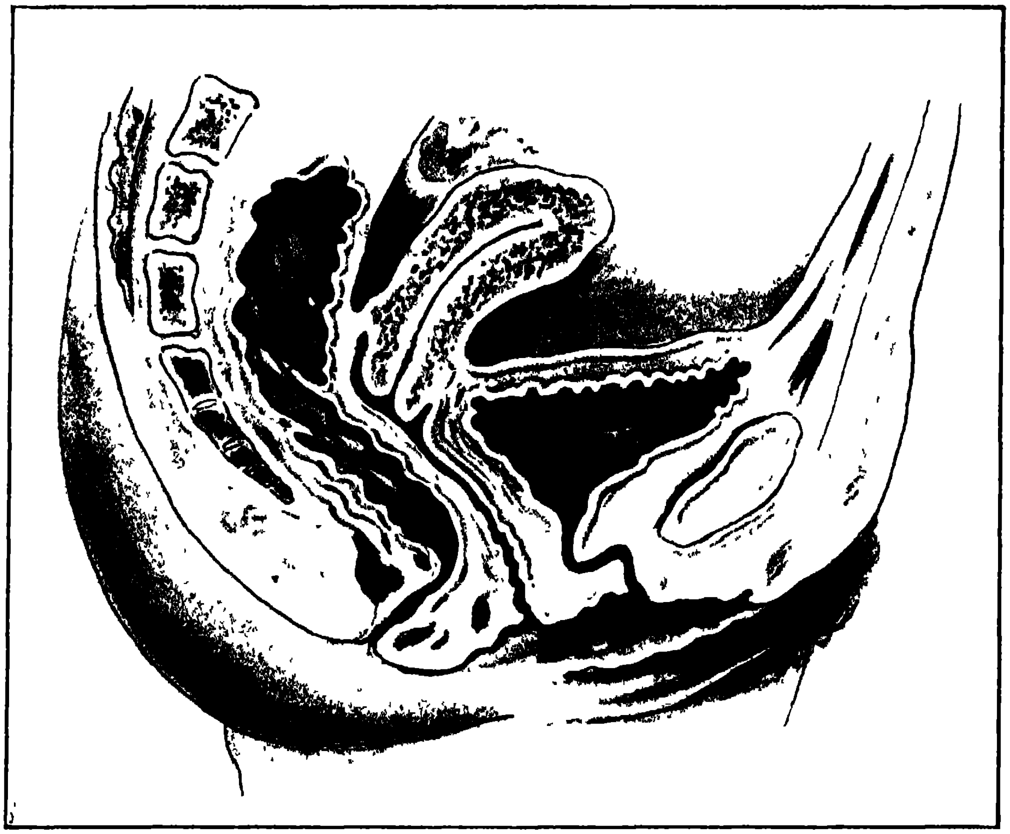

Fig. 479 —Dislocation of the upper third of the urethra.

If the prolapsus is very marked, or if palliative treatment fails, the projecting mucous membrane should be excised by a circular incision and the raw surface covered by interrupted catgut sutures which unite the mucous membrane of the urethra with that of the meatus.

Foreign bodies in the urethra are the same as those in the bladder and are inserted there in the same way, usually being introduced in attempts at masturbation. Vesical calculi may be lodged in the urethra.

The **symptom** is dysuria or complete retention of urine.

The **diagnosis** is made by the urethral sound, the urethroscope, and palpation of the canal through the vagina.

The **treatment** is extraction of the foreign body by a narrow-bladed forceps, or by snaring it with a wire loop, the forefinger pressing it downward through the urethrovaginal septum. If its extraction by the meatus is impossible, an incision may be made over it in the urethrovaginal septum, which should be united again by sutures.

Urethral fistula is very rare It follows pressure-necrosis of the urethrovaginal septum after labor. It is recognized by inspection and by the use of a probe. There is no incontinence of urine unless the neck of the bladder is involved The fistula is closed by the same operative procedures demanded by vesicovaginal fistulæ

Skene calls attention to an incomplete urethral fistula in which a blind sinus leads from the urethral canal into the tissues of the urethrovaginal septum There is persistent suppuration of the sinus tract, with a purulent discharge from the meatus, irritation of the urethra, and frequent painful urination By palpation an inflammatory infiltration of the urethral wall is felt, by endoscopy the orifice of the sinus is seen in the urethra, and by inserting a small probe with a curved point, the direction and extent of the fistulous tract can be determined.

The **treatment** is an incision into the lowest portion of the sinus from the vagina, making the fistula complete. By using a catheter to prevent the irritation of the urethra by micturition and by irrigating the urethra with boracic acid solution, the fistula usually closes spontaneously. If it does not, it can be closed by a plastic operation.

Tuberculosis of the urethra is secondary to tuberculosis of the rest of the urinary tract The tubercular inflammation is usually centered in Skene's glands, which are distended with caseous material and are ulcerated around their orifices The local inflammation can be cured by the insertion of an electrocautery point into the follicles and their destruction. If there is a more extensive involvement of the urethra the local treatment might be the application of the Röntgen and the Finsen ray or excision of the diseased area; but the disease of the bladder and kidneys accompanying the tubercular urethritis makes the latter of subordinate importance.

Floating Kidney.—All the diseases of the kidney are common to both sexes, but a dislocated and mobile kidney deserves a place among the diseases of women. It is rarely found in men. In Edebohls' 186 operative cases only 3 were in men. Legry's, Lanceraux's, Landau's, Skorezewsky's, and Morris' statistics show that women are five to ten times more frequently affected than men, and that the latter rarely require operative treatment.[1] The investigation of the position and mobility of the kidneys is a part of every gynecological examination. About a fifth of all women examined exhibit an abnormally low and mobile right kidney, with its lower pole often at or below the level of the umbilicus. It is rare to find both kidneys abnormally mobile and low in situation in the erect or sitting posture. If both are displaced, the right is almost always the lower and more mobile of the two. Only a small proportion of women with a displaced and mobile kidney exhibit symptoms traceable to the renal displacement and require treatment.

The causes of floating kidney are not clearly understood. The pouch in which the kidney rests is shorter and broader below in the female; this peculiarity is most marked on the right side. Other reasons why the right kidney is displaced more than thirteen times oftener than the left are found in the weight of the liver; the greater length of the renal vessels on the right side; the loose connection between the ascending colon and the right kidney; an aponeurotic layer between the peritoneum and the anterior surface of the left kidney, absent on the right side; and the connection of the left suprarenal capsular vein with the renal vein. These conditions, however, do not give the left kidney immunity from displacement and mobility. Both kidneys are displaced and mobile in 5 per cent. of the cases of floating kidney. Lifting heavy weights; traumatism, as a kick or blow in the lumbar region, a violent jolt or jar; rapidly repeated pregnancies; evacuation of fluids from the abdomen; emaciation, especially with absorption of the fatty capsule of the kidney, diastasis of the abdominal recti muscles; pendulous abdomen; gastroptosis and enteroptosis, usually from premature exertion on the feet after childbirth; the recurrent hyperemia of the menstrual periods; relaxation of all the tissues in an anemic, weak woman; increased weight and size of the kidney from any cause; tight lacing; high-heeled shoes; and violent or repeated coughing, sneezing, and hiccoughing have all been considered as the causes of floating kidney.

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[1] Morris, "Surgical Diseases of the Kidney and Ureter."

Of all these causes, absorption of the fatty capsule of the kidney in emaciated women is regarded as the commonest, but perhaps it is because the diagnosis of floating kidney is so much more easily made in such women. I have found very mobile kidneys in fat women by intra-abdominal palpation during an abdominal section, that could not be diagnosticated by the ordinary methods of examination.

The symptoms of floating kidney are subjective and objective.

The subjective symptoms are a dull aching pain and dragging sensation in the back and side or between the shoulders; crises of pain suggesting renal colic; neuralgic pains of the great nerve-trunks on the affected side; a sensation of something moving in the abdomen, somewhat like fetal movements; the appreciation by the patient herself of a "lump" in the abdomen which appears and disappears; varied disturbances of the gastro-intestinal tract, such as vomiting preceded by epigastric pain, sudden gaseous distention of the abdomen, obstinate constipation varied perhaps by diarrhea, violent attacks of colic, with nausea, vomiting, flatulence, and occasionally signs of collapse (Dietl's crises); abnormalities of urinary secretion, as polyuria, frequent micturition, pyuria and hematuria; and symptoms of associated irritation of the gall-bladder or of the appendix. The patient often complains of inability to stand or sit erect, she is disposed to stoop. She finds herself instinctively raising the right shoulder or habitually keeping it higher than the left if the right kidney alone is displaced. The symptoms usually disappear in the recumbent posture and are excited or aggravated by standing or walking.

A large proportion of women with mobile and displaced kidneys have no symptoms at all traceable to a floating kidney. The percentage of cases requiring operation or other treatment is very small indeed.[1]

The objective symptoms are elicited by palpation of the kidney and the abdomen, and by abdominal percussion.

The palpation of the kidney has already been described The best position of the patient for it is the erect sitting posture, with the back, head, and feet supported, the arms hanging limp alongside of her, with quiet, regular mouth-breathing. Other postures for the examination are the supine, with the legs drawn up and the feet supported; the knee-elbow; the erect posture, with the trunk flexed and the arms supported on a chair or the shoulders leaning against a support; the lateral and the Sims' or semi-prone position. The bimanual grasp of the kidney has been described (p. 535).

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[1] For example, in my hospital services and office practice during the last year I examined or had examined for me considerably more than a thousand patients All these women were routinely examined for the position of the kidney Out of this number only 5, in my judgment, required nephrorrhaphy, although something like 200 had a demonstrably displaced and mobile kidney.

A floating kidney sometimes behaves most peculiarly in its mobility and displacement In the course of an examination it may be replaced and can not again be dislodged. It may be markedly displaced and mobile one day, but remain in perfectly normal position without mobility for days together. Repeated examinations, therefore, are sometimes required to recognize a floating kidney, and the patient should have been moving about actively on her feet, if possible, before the examination is made.

In the average case the lower pole of the right kidney is on a level with the umbilicus; by compressing this pole between the fingers of the two hands the kidney may be made to slip up under the floating ribs, returning again, as a rule, to its low position when the pressure on the flank is removed. It is not uncommon to find the lower pole two or three inches below the umbilicus and the whole length of the kidney palpable below the ribs In exceptional cases it is possible to push the kidney into the pelvis, up under the ribs and across the median line to the other side of the abdomen. The physician or patient may grasp the kidney through her abdominal walls and move it about at will. The long axis of the kidney may remain longitudinal, may be oblique, or even transverse.

It is the mobile and not the displaced kidney that causes symptoms. A kidney adherent to the pelvic brim is usually accidentally discovered as an obstacle in labor.

Percussion yields a muffled tympanitic note over the displaced kidney and there is some resonance over the vacated kidney pouch from behind, which disappears when the kidney is pushed back into place. Hydronephrosis is a frequent accompaniment of floating kidney, which may remain permanently enlarged or be subject to acute attacks of distention with remissions in which the dilatation apparently disappears. In the attacks the symptoms may be serious; intense pain, rapid pulse, and high temperature may be observed. The hydronephrosis is due to a kink in the ureter.

Treatment.—As already stated, many cases require no treatment at all If any of the symptoms detailed above are clearly traceable to a floating kidney; if appendicitis,[1] or other disease of the alimentary tract can be excluded; if the pelvic organs are normal or if with other disease in the abdomen or pelvis it is possible to differentiate the symptoms and physical signs of floating kidney from associated affections, treatment is indicated.

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[1] Edebohls is a firm believer in the association of appendicitis with floating kidney. It is probable, however, that the discomfort of appendiceal irritation leads a patient to seek medical advice. In at least a fifth of such cases the kidney is mobile. An enthusiast in the surgical treatment of floating kidney could easily see in such an accidental association an additional indication for nephrorrhaphy.

The treatment is palliative and radical, or operative. There are two kinds of palliative treatment One is to subject the patient to a rest cure, with forced feeding, electricity, and massage. A long retention in the recumbent posture with increased fat deposits in which the fatty capsule shares; the increased tonicity of the abdominal walls secured by electricity and massage,[1] have not infrequently cured a floating kidney permanently. The second method of palliative treatment is the adjustment of a belt or corset, reinforced sometimes by a pad, to increase intra-abdominal pressure in a direction from below upward. The simplest and often the best support for a floating kidney is the straight-front corset, put on in the recumbent posture and fastened from below upward, while a hand is inserted under it to lift the abdominal wall upward. It is sometimes necessary to sew a wedge-shaped pad with the base below to the inner side of the corset and on the affected side, not with the idea of directly pressing upon and affording the kidney support, but to increase intra-abdominal pressure and thus indirectly to contribute to the support of the kidney Occasionally a pneumatic pad is more comfortable than a solid one. It is sometimes necessary to adjust the support with the patient in the Trendelenburg posture over the back of a chair, laid face downward on the bed. A woven abdominal binder with a pad on its under side may be more comfortable and more effectual than the corset.

If the palliative treatment fails to relieve the patient; if her symptoms are so troublesome or painful that she demands relief; if she is not willing to endure or can not afford the partial or complete invalidism that a floating kidney sometimes entails; if the nervous system threatens to break down under the strain of continued suffering or of acute crises of pain, the radical or operative treatment should be advised. There are two operations to be considered for floating kidney—nephrorrhaphy and the junction of the recti muscle-sheaths for diastasis

Nephrorrhaphy.—Many methods have been proposed and adopted for fixing a floating kidney since the first operation by Hahn in 1881. Sutures through the kidney substance and the back muscles; the utilization of the last rib as a fixed point; gauze packing or rubber tubing around the kidney, emerging from the lumbar wound, to produce adhesions, all have had their advocates. The technic of Edebohls described in 1901 [1] has proved in the author's experience so much more satisfactory than any other that in his judgment it is the only one meriting description. Any one who contrasts in actual practice the Edebohls operation with the others will be loath to return to the older methods. The steps of the operation are thus described by its author:

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[1] Special methods of massage in the renal region (vibratory movement) are a useless waste of time

"Place the patient prone upon the table with Edebohls' kidney air-cushion underlying and supporting the abdomen (Fig. 480).

"Make a straight incision along the outer border of the erector spinæ from lower border of last rib to crest of ilium Should the space between the rib and ilium be unusually narrow, carry the incision a little more obliquely, so that its lower end will reach the ilium slightly to the outer side of the attachment of the erector spinæ.

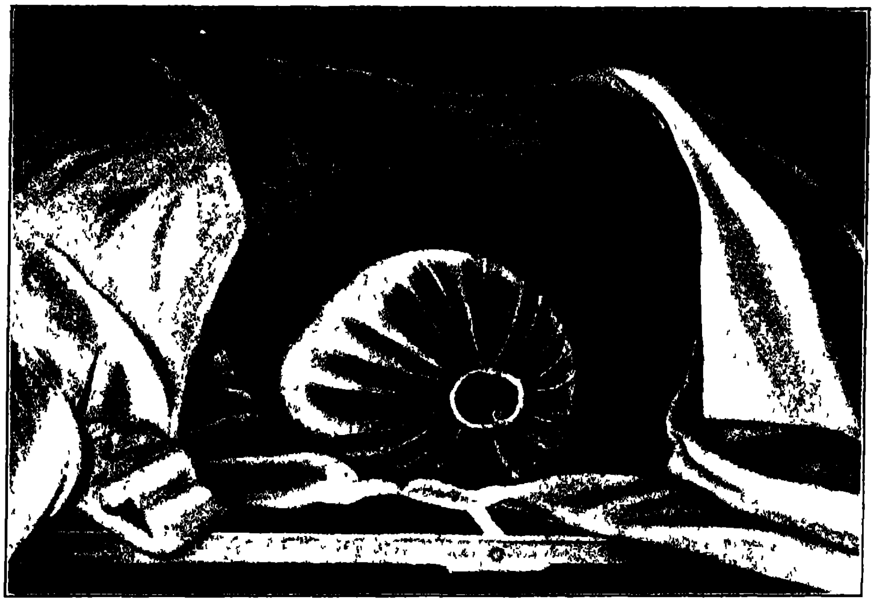

Fig. 480.—Edebohls' kidney air-cushion, with patient in position for operation.

"Bluntly separate the fibers of the latissimus dorsi from each other just over the outer border of the erector spinæ, without opening the sheath of the latter. Split the transversalis fascia and expose the perirenal fat. Draw the iliohypogastric nerve to one side or other out of the way of injury. If this can not be done and the nerve must be divided, reunite the severed ends with catgut after anchoring the kidney and before closing the wound.

"Open the sheath of the quadratus lumborum from rib to ilium along the anterior aspect of its lateral border. The retraction of the cut edges of the sheath will expose a large area of raw muscle.

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[1] Before the Medical Society of the State of New York, October 15, 1901.

"Free the kidney as far as necessary by blunt dissection with the fingers, aided by an occasional clip of the scissors.

"Deliver the kidney with its fatty capsule through the wound onto the back. Traction upon the fatty capsule, aided by rolling the patient upward or downward, as may be necessary, on the air-cushion, facilitates this part of the procedure. The upper pole of the kidney generally, though not always, emerges first, the rest of the organ following. Should the opening through the walls of the abdomen prove too small for delivery of the kidney, enlarge it by nicking the outer fibers of the quadratus near its iliac insertion.

"Dissect off and remove the whole of the fatty capsule, exposing the capsule proper throughout its entire extent. Explore by palpation the kidney, its pelvis, and the upper end of the ureter. Should anything be found to indicate puncture or incision, this is the proper time to perform either.

"Nick the capsule proper of the kidney near the middle of the convex border just sufficiently to admit the tip of a grooved director. Pass the director through the opening and on beneath the capsule proper, between the latter and the kidney, and upon it divide the capsule proper along the entire length of the convex border of the kidney to half-way around both the upper and lower poles of the organ. Separate the capsule proper by blunt dissection on either side of the incision from the kidney substance, and reflect it forward and backward toward the renal pelvis to about midway between the external and internal borders of the kidney. This will leave denuded one-half of the kidney, more or less, the detached portion of the capsule proper being continuous with the still attached portion and turned back upon it like the lapel of a coat. Resect a portion of the detached capsule proper, if too redundant.

"Pass four suspension or fixation sutures of forty-day catgut[1] through both the reflected and the still attached capsule proper, close to their line of junction. Two sutures are placed on the anterior face of the kidney, one at the middle of the upper and one at the middle of the lower half of the organ. The two other sutures are placed at corresponding points of the posterior surface of the kidney. Each suture runs parallel to the long axis of the kidney, and is passed through the reflected capsule close to the line of reflection, then through the underlying attached capsule, and along beneath the latter between the capsule and the kidney substance, for a distance of two or three centimeters, when it again emerges through the attached and reflected layers of the capsule (Fig. 481). Use a Hagedorn needle, with the broad surface running flatwise between the capsule proper and the kidney substance, to avoid penetration of the latter.

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[1] The author uses formalin gut of three or four weeks' durability.

"Pass the kidney with the eight free suture ends hanging from the capsule proper back into the body. Pass each suture end in succession through the abdominal parietes from within outward, four to the inner and four to the outer side of the incision, each suture piercing the tissues at a distance from its fellow of the opposite surface equal to the anteroposterior thickness of the kidney. The sutures to the inner side of the incision will pierce the retracted sheath of the quadratus near its edge, the quadratus itself, and the erector spinæ; the outer sutures will traverse the transversalis fascia and the latissimus dorsi. All of the sutures will emerge upon the surface of the latissimus dorsi at distances from each other equal to those at which they leave the capsule proper, the highest suture ends emerging immediately beneath the twelfth rib (Fig. 482). Leave the sutures untied for the present.

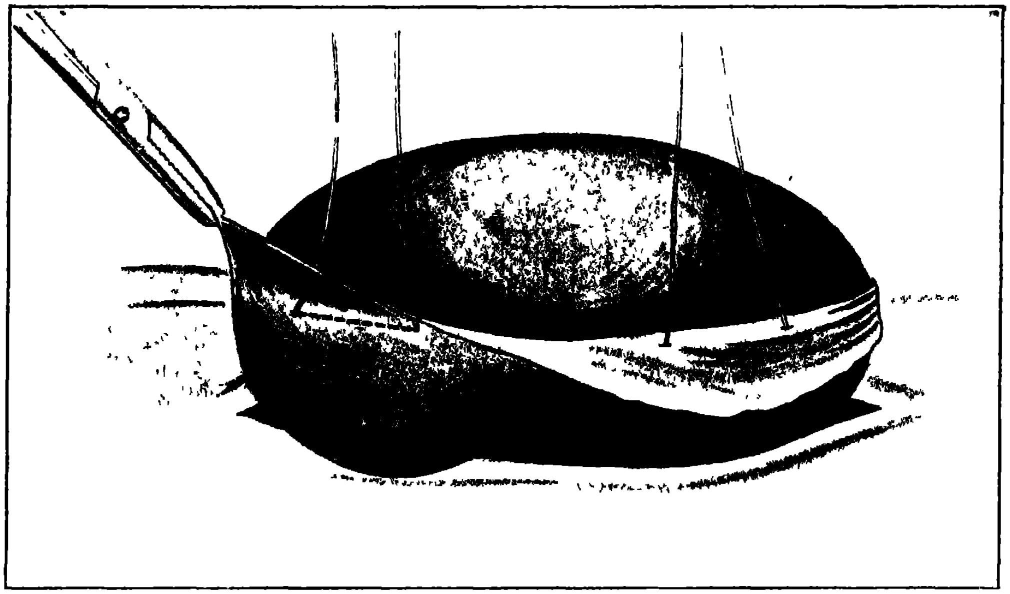

Fig 481 —Showing two of the four suspension sutures passed through reflected and attached layers of capsule proper, without penetration of kidney substance. The two companion sutures, passed on the opposite face of the kidney, are not shown (Edebohls).

"Close the wound of the muscles and fascia by from four to six interrupted sutures of forty-day catgut, passed in such a manner as to turn the raw surface of the quadratus toward the kidney. This is effected by suturing the latissimus dorsi and the lumbar fascia forming the outer lips of the wound to the latissimus dorsi, the sheath of the erector spinæ and the outer lip of the open sheath of the quadratus at the inner margin of the incision.

"Gently draw taut the eight ends of the fixation sutures to

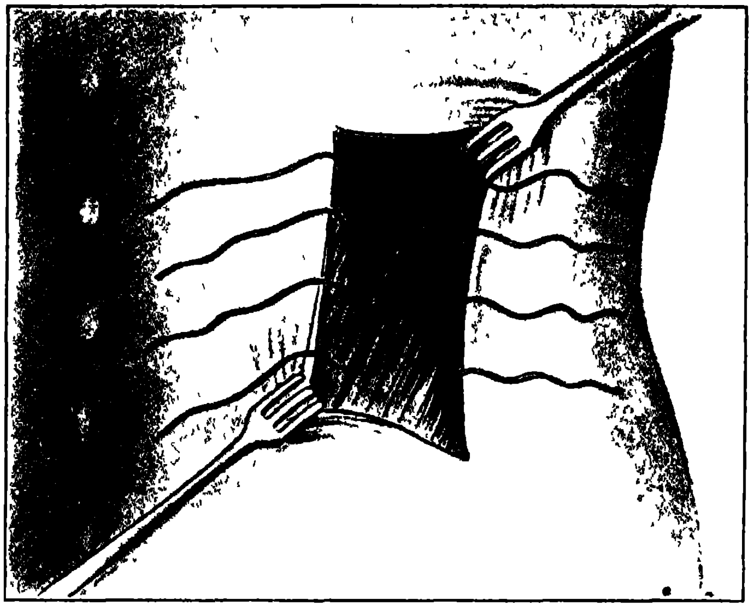

Fig. 482.—The kidney has been replaced and the ends of the suspension sutures have been brought through the abdominal wall, emerging on the outer surface of the latissimus dorsi The fibers of the muscle have been separated from each other, not cut, in making the incision (Edebohls).

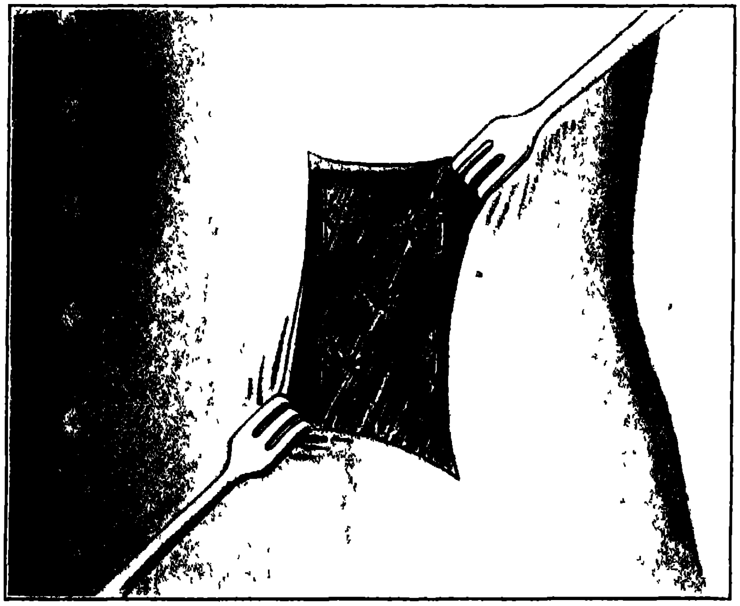

Fig. 483.—Suspension sutures and sutures closing deep parts of wound tied (Edebohls).

take in slack between the internal surface of the abdominal parietes and the capsule proper, so as to bring the denuded surface of the kidney into contact with the raw surface of the quadratus. Tie the two ends of each of the four suspension sutures to each other (Fig. 483). Bury the suspension and muscle sutures by closing the skin over them with the intracuticular suture.

"The completed operation will leave the denuded convex surface of the outer half of the kidney in snug contact with the raw quadratus lumborum throughout the entire length of the latter from rib to ilium (Fig. 484), the upper pole of the kidney projecting slightly upward beneath the ribs and the lower pole reaching to an equal extent below the level of the iliac crest.

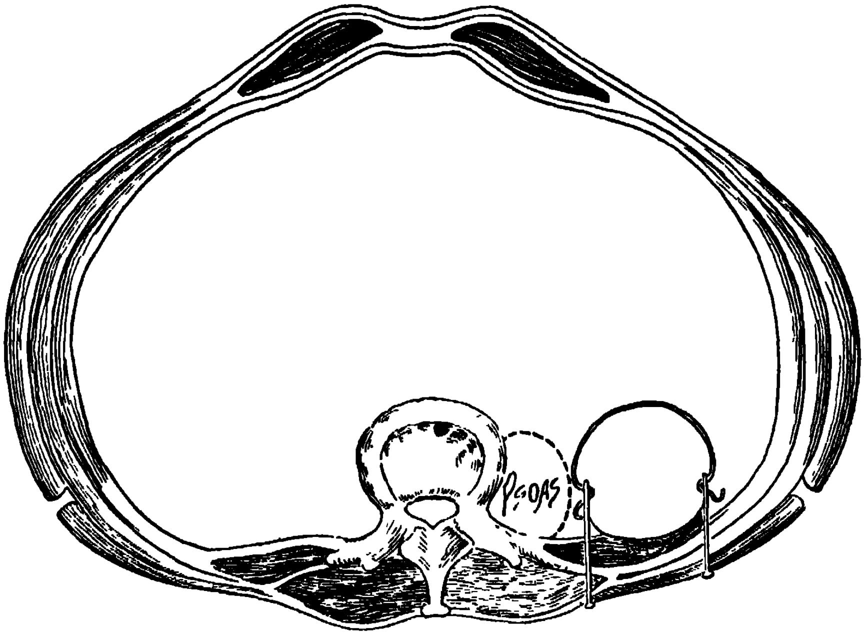

Fig. 484.—Effects of the completed operation, showing broad apposition of the denuded kidney and rawed quadratus. The track of the suspension sutures is also shown (Edebohls)

"Apply the dressings across the entire width of the back, smoothly and evenly, remembering that the patient is to lie upon them for a week before changing."

The Support of a Floating Kidney by the Operative Treatment of Diastasis of the Recti Muscles.—If a floating kidney follows childbirth and is associated with diastasis of the recti muscles, pendulous abdomen, enteroptosis, and gastroptosis, nephrorrhaphy alone will not make the patient comfortable, and may not be necessary. If an abdominal binder, electricity, massage, and Swedish exercises fail to restore tone to the relaxed abdominal walls and to correct the splanchnoptosis, uniting the sheaths of the recti muscles as proposed by J. C. Webster often gives the kidneys as well as other abdominal organs such good support and the patient such perfect symptomatic relief that nothing further is required. This operation, therefore, should precede or replace nephrorrhaphy in suitable cases. The author's technic is as follows: An incision is made from midway between the umbilicus and the ensiform cartilage to the symphysis. The skin and subcutaneous fat are dissected off the fascia until the sheaths of both recti muscles are exposed. The sheath of one muscle at its inner edge is nicked with a knife until the muscle itself comes into view; the sheath is slit with scissors the whole length of the wound; the other sheath is similarly treated. The recti muscles are freed from their underlying attachments by a blunt dissection. Four to six mattress sutures of formalin gut (No. 3) are passed through the outer edges of the muscle-sheaths, skipping

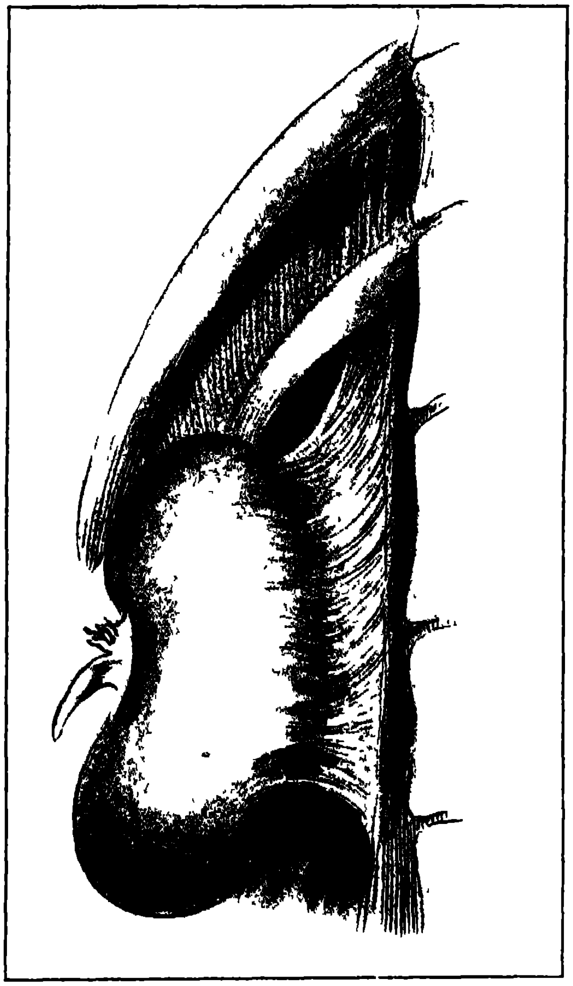

Fig 485.—After Mayolle, from a patient of Duret, who died of pulmonary tuberculosis six months after right nephropexy. Kidney turned outward to show connective-tissue band, six centimeters long by two centimeters thick, resulting from operation and attaching kidney to posterior abdominal wall (Edebohls)

the tissues between. Silkworm-gut sutures are passed between the mattress sutures taking in the skin, the subcutaneous fat, and the outer edges of the muscle-sheaths. The mattress sutures are tied in a triple knot. A continuous catgut suture (No. 3, formalin) unites the whole length of the outer edges of the muscle-sheaths. The interrupted silkworm-gut sutures are tied. The intervening skin surfaces are joined either by a continuous catgut suture or Michel's clamps The silkworm-gut sutures remain for ten to twelve days, when they are removed.

Nephro-ureterectomy in Women.—Descriptions of nephrectomy are out of place in a treatise on diseases peculiar to women. In operations for tuberculous kidney, however, or for pyonephrosis and infected sacculated ureter from any cause with which the gynecologist not infrequently has to deal, the question of removing the whole or a great part of the ureter arises.

Technic of Ureterectomy in Women —The ureter may be removed with the kidney by an extraperitoneal or a transperitoneal operation. In the former the incision may be lumbo-ilio-inguinal or lumbo-ilio-inguinal and vaginal. In the latter the incision is made through the semilunar line, the peritoneum over the ureter is buttonholed so that successive lengths may be pulled out, the wounds in the peritoneum being subsequently closed by suture.

If the combined lumbar and vaginal incision is selected, the vagina may be opened last to secure and remove the stump of the ureter left after its amputation above, or the operation may be begun by a vaginal section, detachment of the ureter from the bladder, and its extraction from above through the lumbar and inguinal wounds. It is not absolutely necessary to tie the stump of the ureter, as regurgitation of urine is rare; but the majority of operators must feel, as the author has, that it is safer to do so. Bovee [1] has collected the records of 41 operations. The author has done one not included in Bovee's statistics, a complete ureterectomy by a lumbo-ilio-inguinal incision for tuberculosis of the kidney, though it appeared by an examination of the specimen after the removal that the ureterectomy was not really necessary. The patient recovered and gained twenty pounds in the six weeks following operation

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[1] "Nephro-ureterectomy," "N. Y. Med Jour.," Jan. 25, 1902.

PART XII.

THE DETAILED TECHNIC OF GYNECIC SURGERY.

The Operating Room.—The requirements for a modern operating room differ as the room is designed simply for operative work or for the instruction of students in addition. In the former case the following considerations should be taken into account: The floor and walls are made of non-absorbable, easily cleansed material. For the former, white hexagonal tiles,[1] and for the latter, glass wainscoting, are the best. The room should be heated to 90° F. There should be no draughts of hot air to blow dust about. The best heating apparatus is a coil of heavy nickel-plated tubes for hot water or steam The floor should

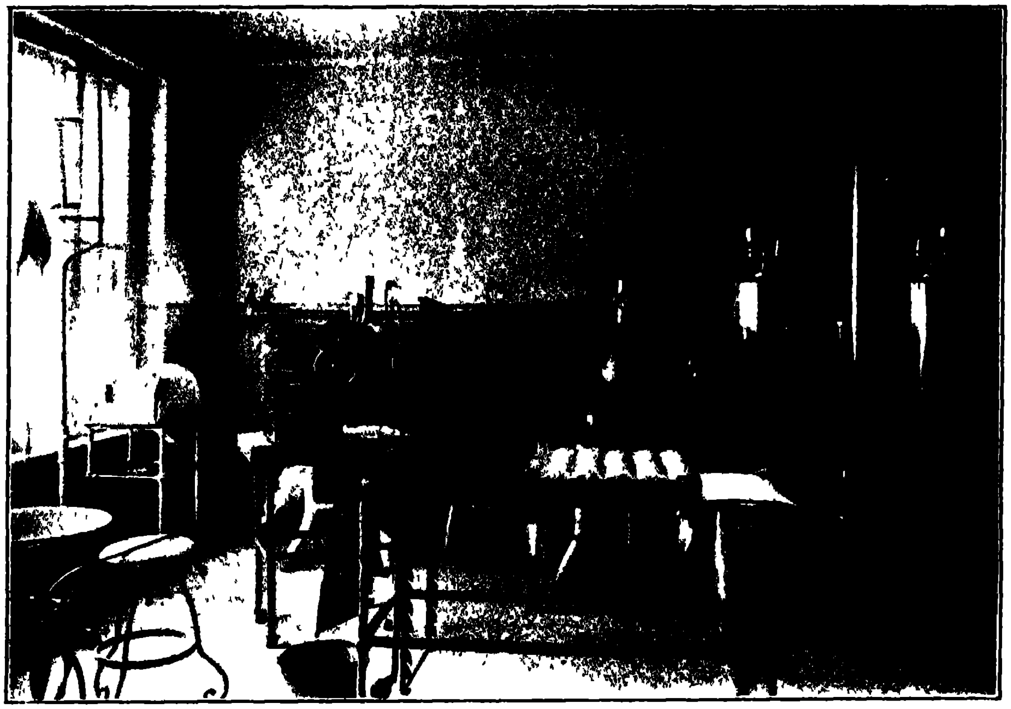

Fig 486—Operating room in the Howard Hospital, of Philadelphia Operating table and room arranged for a plastic operation

have a vent for the water with which it is flushed, but this vent should not communicate with the sewer. In the Howard Hospital it leads into a pipe which stops three feet short of the ground, the water falling into a covered gutter.

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[1] A glass floor was first tried in the operating room of the Howard Hospital It was in many ways ideal, but the expense of repairing the heavy glass plates that were occasionally broken proved too great

The light is furnished by a skylight and windows, so that it is both vertical and horizontal. The light should be from the north. The cut in the roof and wall should be continuous, the glass in the wall and the roof having no intervening structural work except light iron frames. Small hot-water or steam pipes should run along the iron frames of the window and skylight, to prevent chilling the air by the large glass surface, the creation of draughts, and the "sweating" of the glass. A cluster of eight or ten incandescent electric lights should be suspended above the operating table, and there should be one or more plugs in the wall for the attachment of hand and head lights

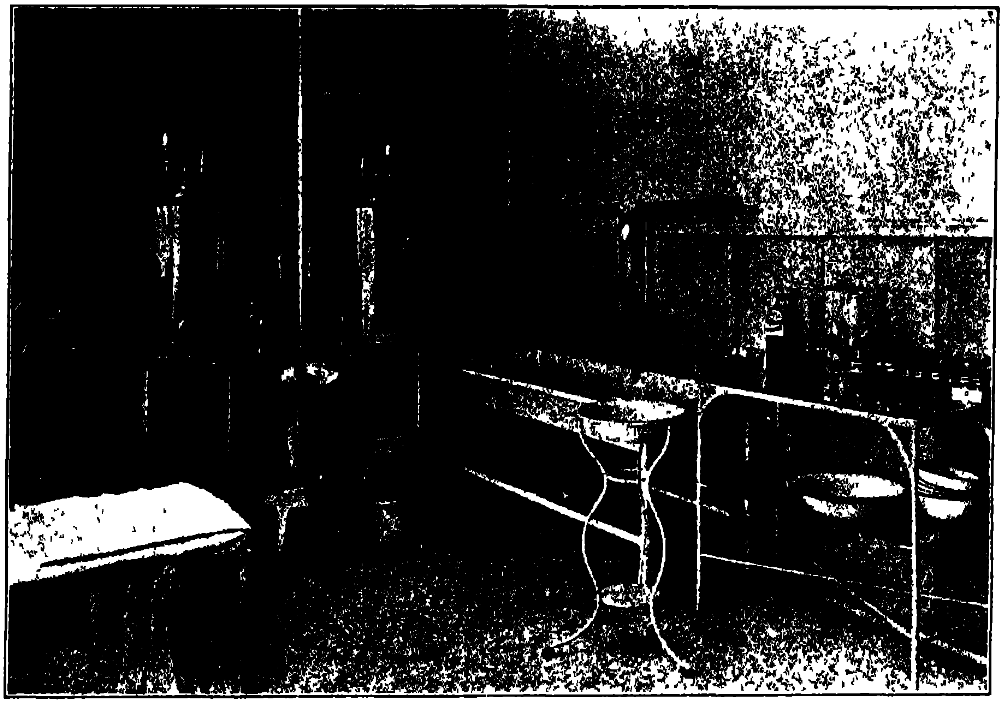

Fig. 487.—Hand disinfection trough and water sterilizers (Howard Hospital).

The sterilizing outfit should comprise two autoclave sterilizers, a water sterilizer, an instrument sterilizer, and an implement sterilizer for basins, pitchers, etc. The sterilizers may be in an adjoining room, but it is more convenient to have them in the operating room itself, if possible, in recesses out of the way and yet accessible. A trough should be provided, long enough for three men to stand in front of, in which sterile basins are placed for the hand cleansing. This trough should have hot- and cold-water spigots with pedal stops, although tap water is not used for the hand cleansing.

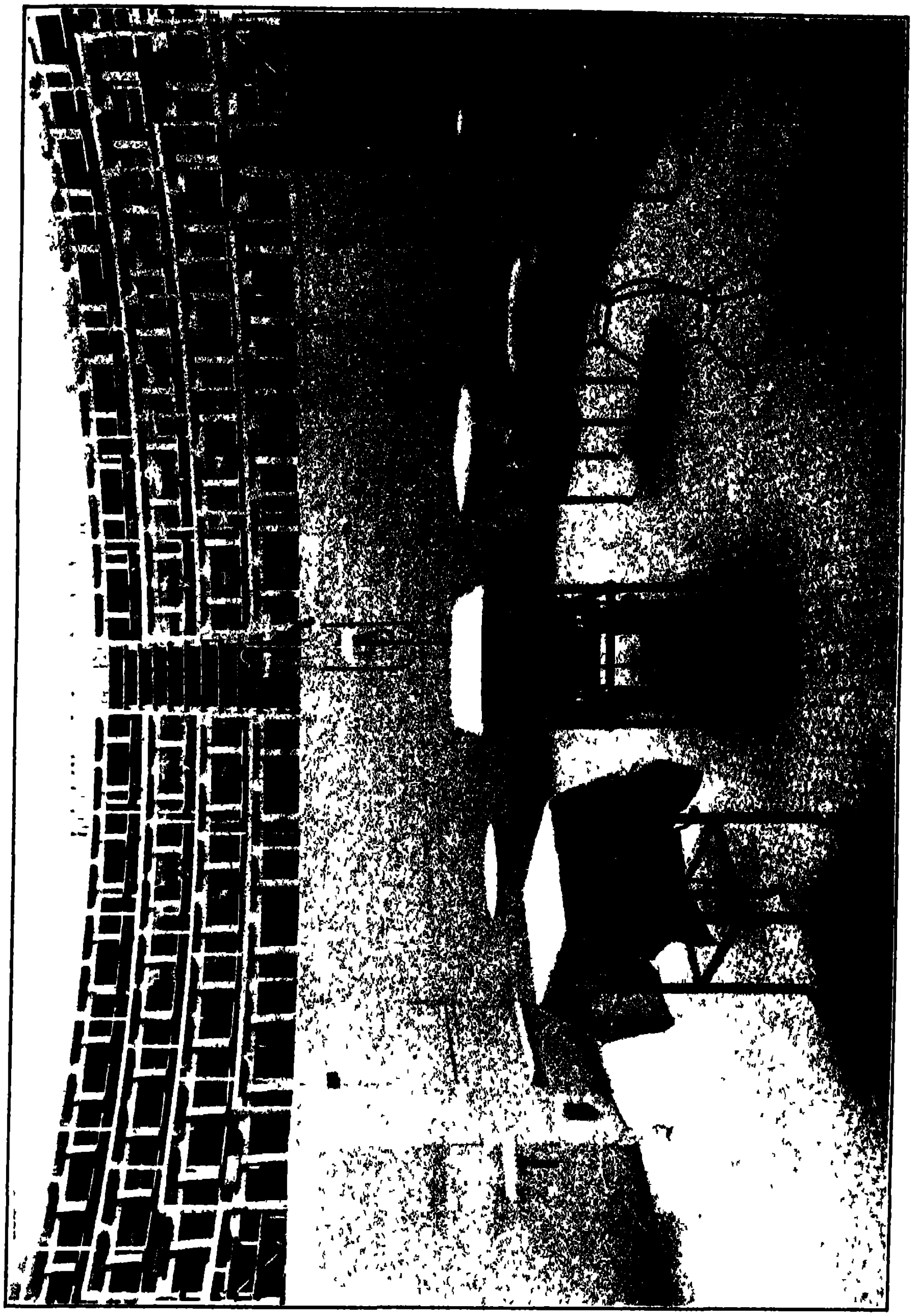

Fig 488.—Clinical amphitheater (Anna Dike Scott Memorial) attached to the maternity of the University of Pennsylvania. The room is arranged for an abdominal section.

The ordinary furniture of an operating room—glass cases for dressings, glass-top tables, basin stands and basins, enameled iron stools, apparatus for normal salt injection, materials for hypodermic stimulation—is naturally required. The instrument cases and instruments should be kept in an adjoining room, as they may be rusted by the moist hot air of the operating room.

A clinical amphitheater for demonstrating pelvic and abdominal surgery to medical students should have ample floor space, so that the operator and his assistants shall not be uncomfortably crowded, and to provide room for two or more operating tables in use at once. In the limited time at the disposal of the teacher, closing the abdominal wound should be relegated to competent assistants, so that two or three abdominal or pelvic operations may be shown in the hour.

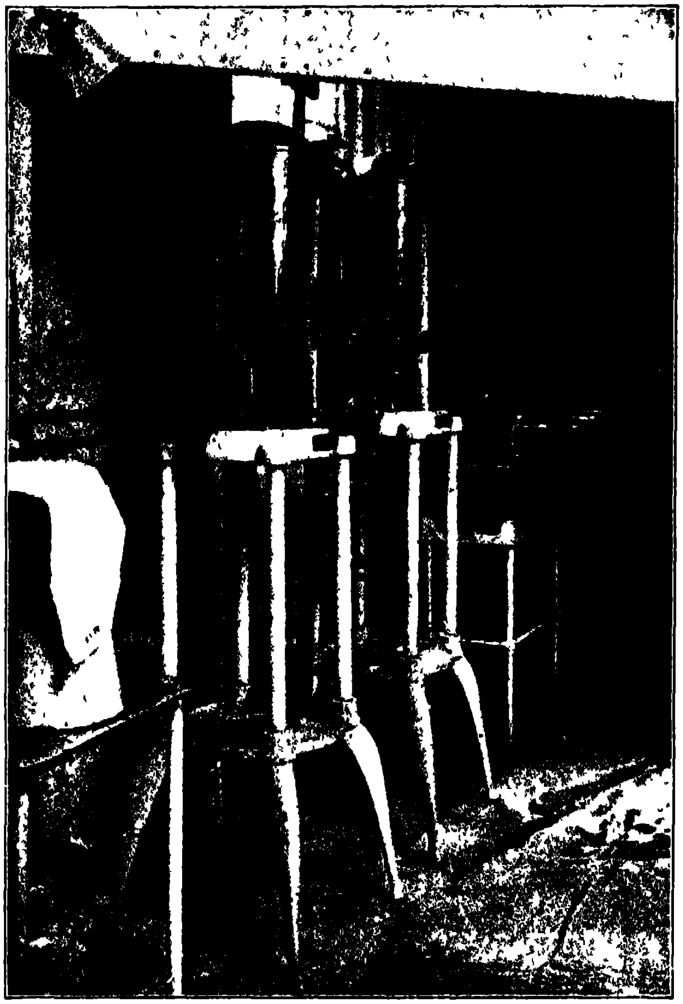

Fig 489 —Water sterilizers; instrument and implement sterilizers in an alcove (University Hospital)

The sterilizing plant should be in view of the students, and they should also witness the hand cleansing process, day after day, so that it may be thoroughly familiar to them. The operator and his assistants should don their head coverings, gowns, and gloves before the students. In short, the whole process of preparing for an operation should be regularly exhibited until at the end of a session each step is so familiar that it could not well be forgotten.

In a private house the room selected for an operation should be near that in which the patient lies in bed. For an abdominal or vaginal section, shortening of the round ligaments and suspending the kidney, the furniture, carpets, and hangings should be removed.

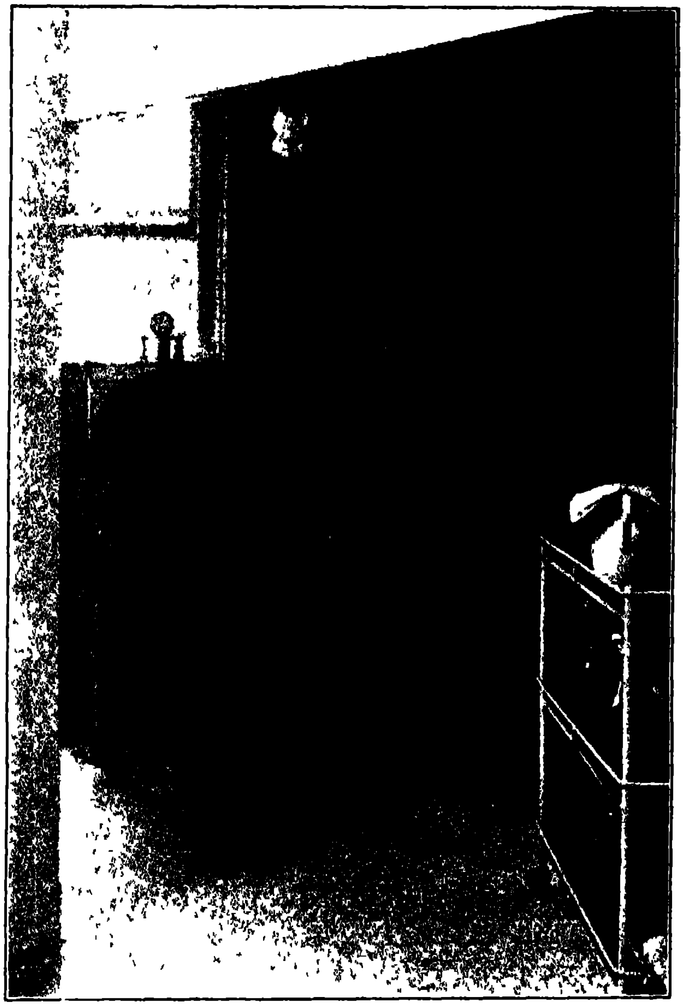

Fig. 490.—Two autoclave steam sterilizers in an alcove, but in view of the students (University Hospital)

The floor should be scrubbed with soap and water, and then mopped with a sublimate solution, shortly before the operation, so that it shall be damp and no dust will be raised by walking over it. For a plastic operation it suffices to tack over the carpet a sheet which has been wrung out in a sublimate solution, but is left moist.

The basins and pitchers are boiled in a large clothes boiler.

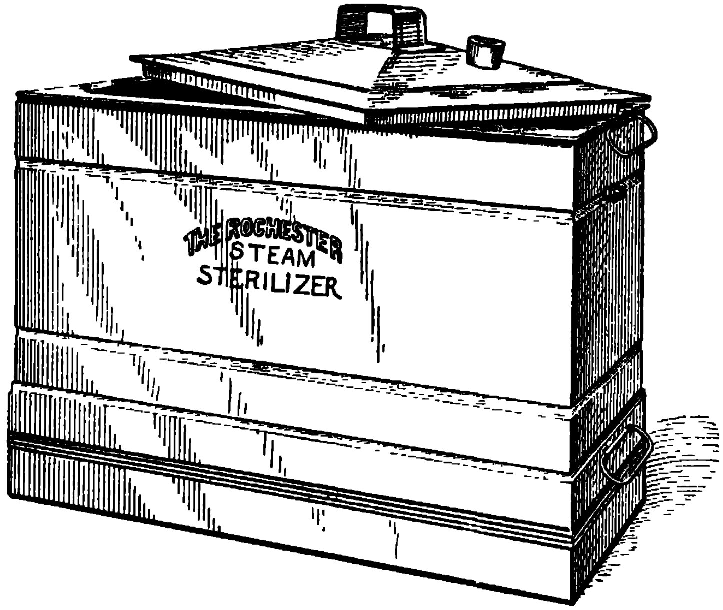

Fig. 491.—The Rochester sterilizer for dressings, etc.

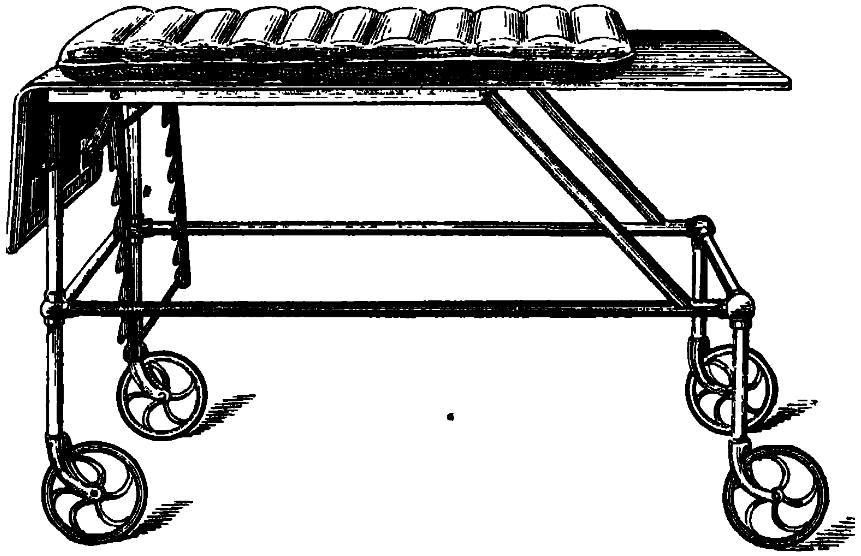

Fig 492.—The author's operating table, of enameled iron with inflated air-cushion.

The dressings and ligature material are sterilized either in the cage of a hospital autoclave, which is transported to the house wrapped in double sheets, or in the house itself in a Rochester steam sterilizer.[1] A large quantity of boiling water is on hand at the hour of operation, and boiled water is provided in pitchers with

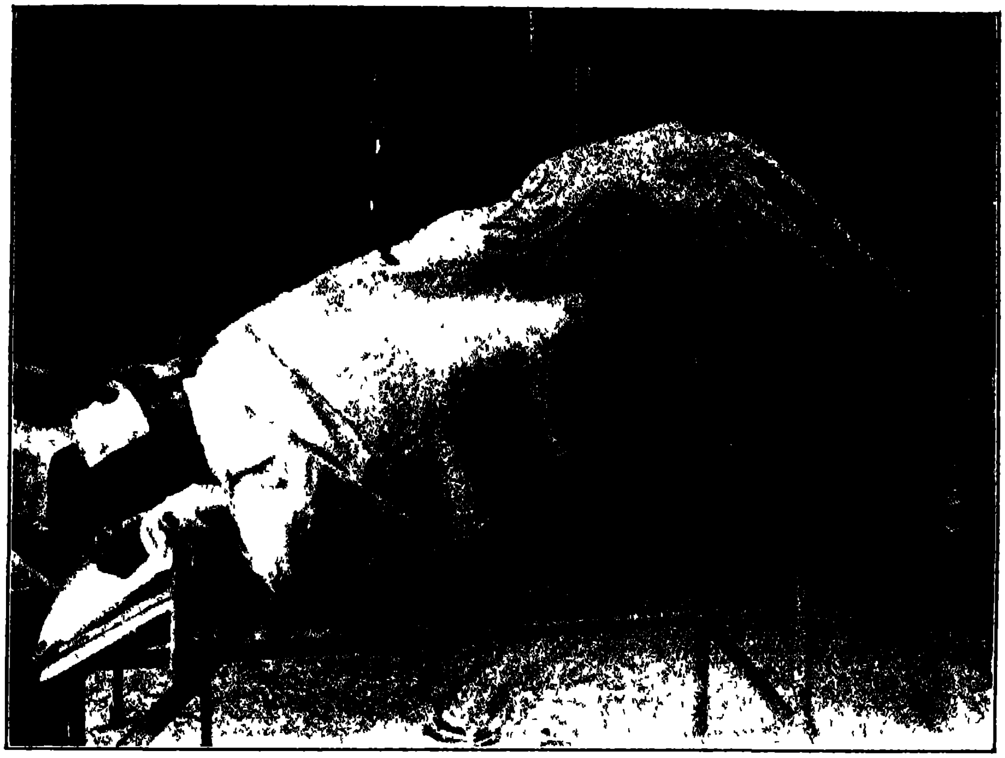

Fig. 493.—Author's operating table in Trendelenburg position

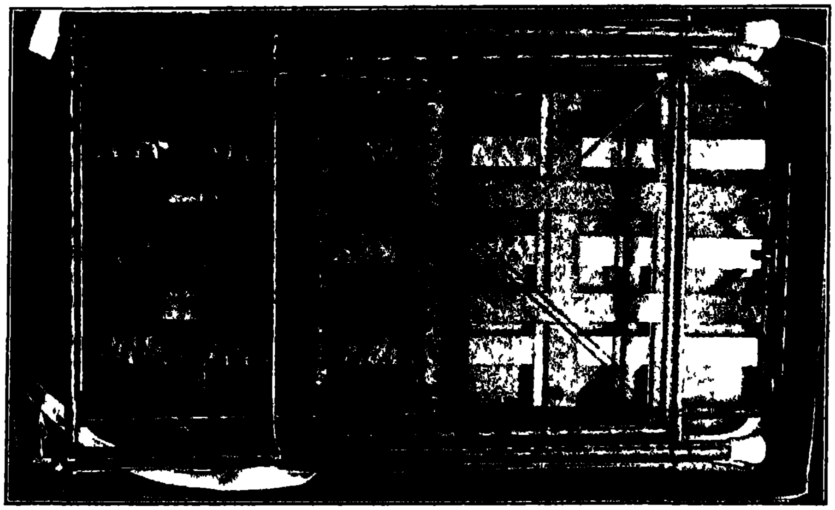

Fig. 494.—Portable operating table in its case.

towels over their tops, plainly labeled on a strip of rubber ad-

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[1] The 18-inch size oblong sterilizer can be packed and put in the autoclave, where it is sterilized under pressure. It is packed in a wooden case, transported to the house, and resterilized just before the operation on its own pan.

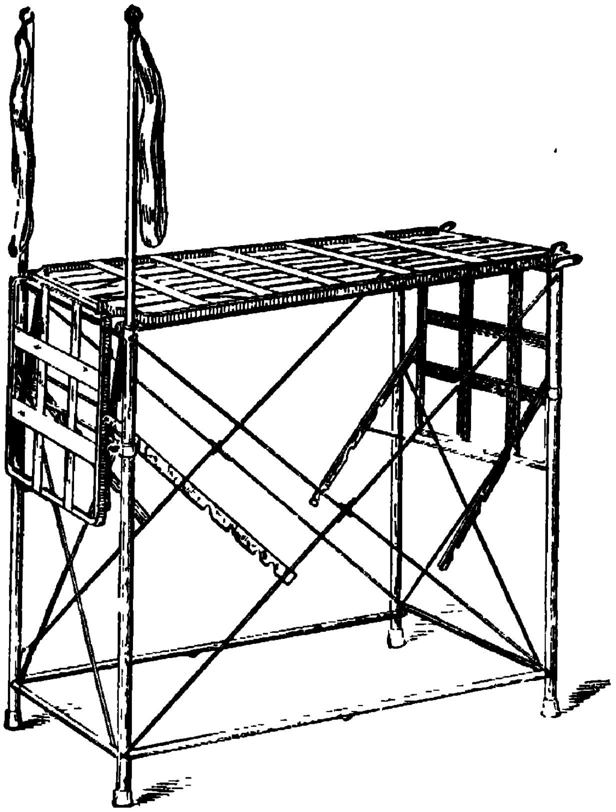

Fig 495 —Portable operating table set up for a vaginal operatio

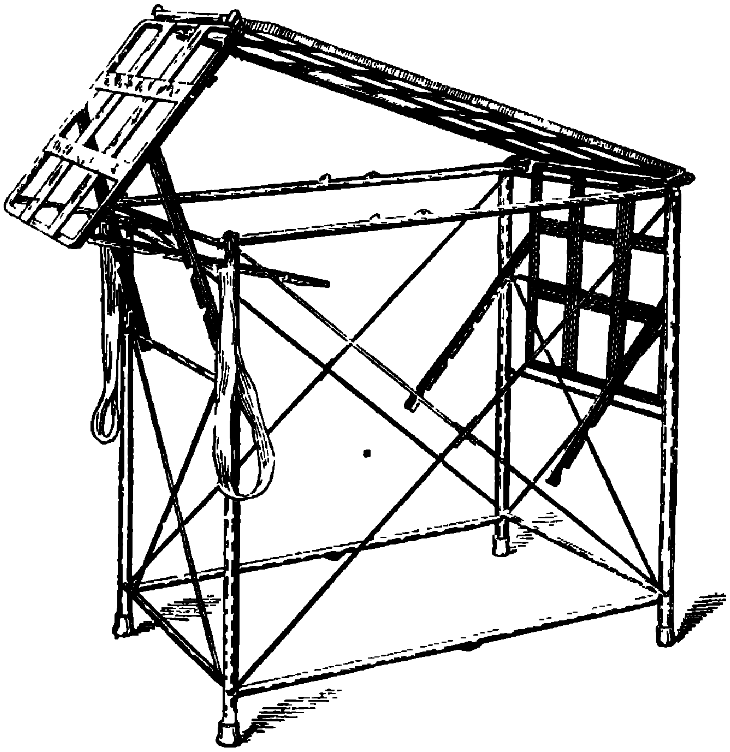

Fig. 496 —Portable operating table in Trendelenburg position.

hesive plaster so that water and sublimate solutions shall not be confused. Two small tables from the household furniture, draped with sterile sheets, suffice for the instruments and pads. Another table, similarly protected, is needed for the autoclave cage or the steam sterilizer.

The operating table should be simple in construction, light in weight, easily moved on large rollers, with a quickly and easily managed hinged arrangement for the Trendelenburg posture. Supports for the shoulders are provided to hold a patient in the Trendelenburg posture, but I do not use them An air-cushion covering almost the whole length of the table is useful, as it saves the patient a great part of the backache usually complained of after operation and keeps her warmer than a glass or iron surface would. It is possible, but not advisable, to fill the

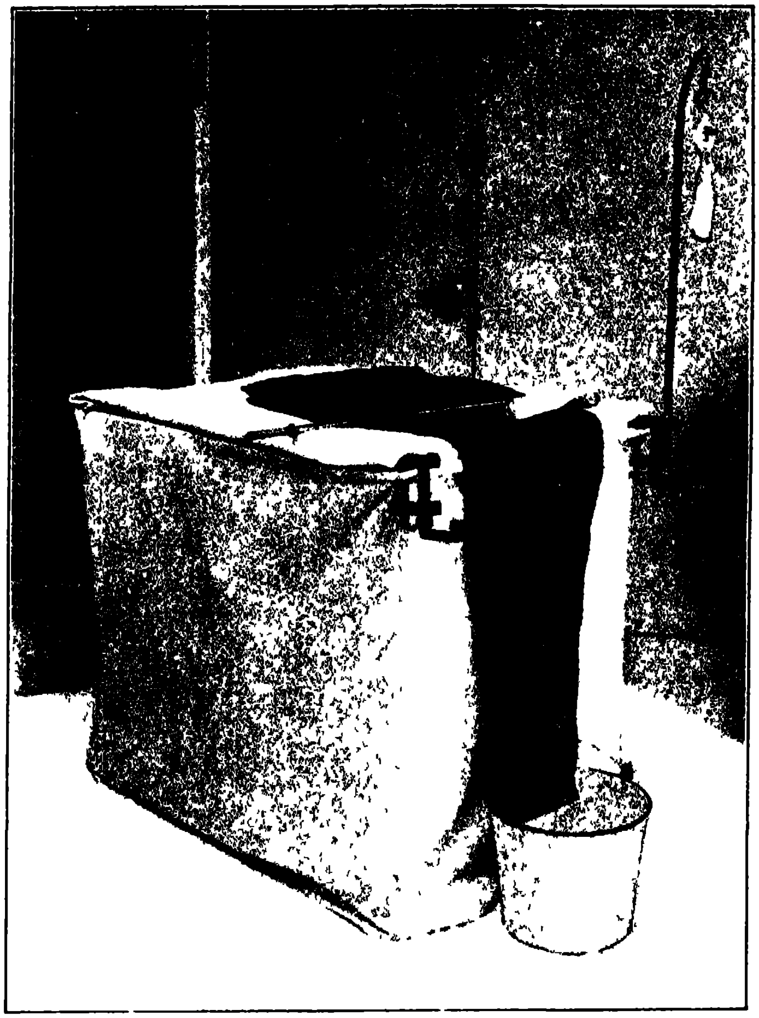

Fig 497.—Kitchen table draped with a sheet and Edebohls' leg supports attached.

cushion with hot water. There is danger of burning her back if the temperature of the water is not carefully regulated. The table is provided with the upright leg supports and stirrups for the feet. A good portable table is a great convenience in private house operations. The table shown in figure 495 has proved by far the most satisfactory in the author's practice. It is light (28 pounds), portable, strong, and easily managed, giving the various postures required in gynecic surgery.

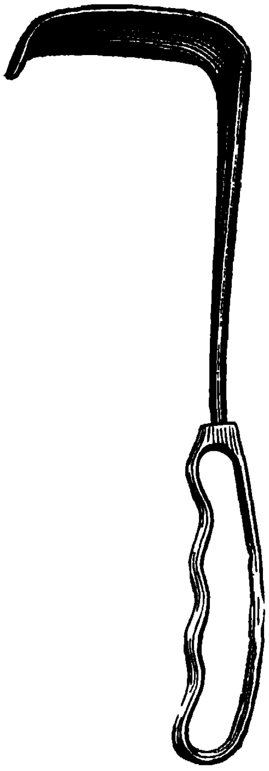

Fig. 498 —Abdominal retractor.

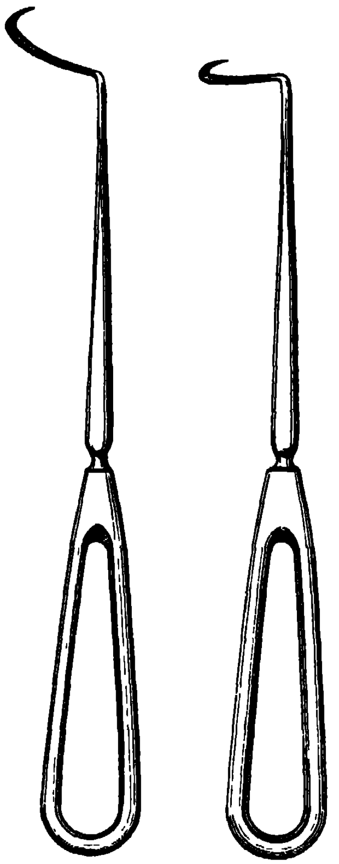

Fig 499 —Author's sharp-pointed pedicle needles for the bases of the broad ligaments

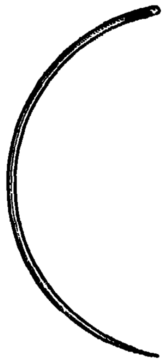

Fig 500 —Author's round-pointed needle for uterine suspension

For plastic operations the Edebohls' clamps and leg supports, which can be attached to any kitchen table, are a reasonable and satisfactory substitute for a specially constructed operating table. The leg-holders, such as Robb's and even Clover's, are unsteady and inconvenient.

Instruments and their Preparation.—For an ordinary abdominal operation (salpingo-oöphorectomy, uterine suspension, hysterectomy, pelvic abscess, small pelvic or abdominal tumors) the following instruments are laid out: 2 knives; 2 abdominal retractors; 1 Thomas' applicator; 1 pair heavy straight abdominal scissors; 2 pairs curved scissors, one heavy, for pedicle, one small; 2 Spencer Well's forceps; 4 pedicle needles, 2 sharp, 2 dull; 6 safety pins; 2 tissue forceps; 18 hemostats; 4 full-curved, spear-pointed needles; 2 curved, round-pointed, fine uterine suspension needles; 3 short medium-curved, spear-pointed needles; 2 short cervix needles for skin. The sharp pedicle needles for

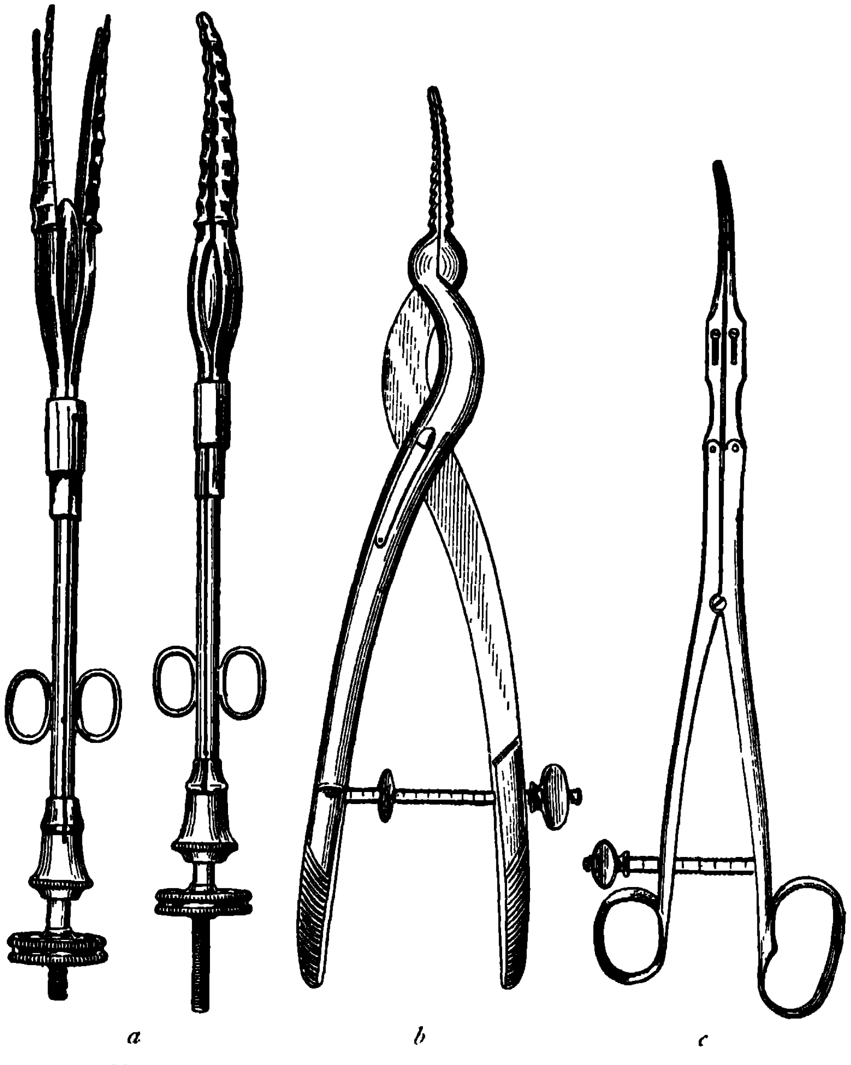

Fig 501.—*a*, Cleveland's dilator, *b*, Wathen's dilator; *c*, Goodell's dilator, modified

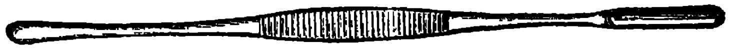

Fig 502.—Martin's curet

the bases of the broad ligament, to secure the uterine arteries, are bent at angles on the shaft, one away from the operator, to be used on the right broad ligament (if he stands on the patient's right side), the other bent toward the operator, for the left broad ligament. These angles make it easier to dodge the ureters.

For an ordinary plastic operation (posterior and anterior colporrhaphy, trachelorrhaphy, dilatation and curettage) the following instruments and materials are required: Wathen's large, Goodell's small, and Cleveland's four-branched dilator; 2 double tenacula; 2 Allis' forceps, 1 shot compressor, and perforated shot; 2 sharp Sims' curets, 1 Martin's curet; an Emmet curet forceps; 18 hemostats; intra-uterine catheter (Fritsch-Bozeman); 1 small pair sharp-pointed scissors; 1 pair small curved scissors; 1 rat-tooth forceps; 1 tissue forceps; 4 full round curved, spear-pointed needles; silkworm-gut, formalin and cumol catgut; assorted sizes Emmet perineum and cervix needles.

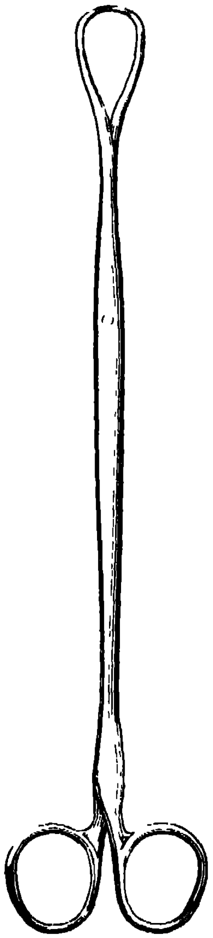

Fig. 503.—Author's double tenacula for the cervix.

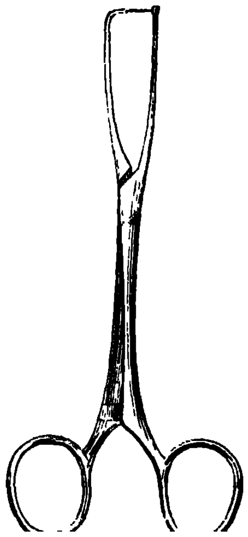

Fig. 504.—Allis' forceps.

The double tenacula for the cervix should have the shape shown in figure 503, so as not to pinch the cervical lips. For other regions the Allis' forceps are more satisfactory (Fig. 504). The Cleveland four-branched dilator is much superior to any of the two-branched dilators, but its insertion should be preceded by the use of a small and of heavy dilator, the dilatation being carried to about three-fourths of an inch. The four-branched dilator should be gradually opened to 90 mm. on the scale, except in ill-developed, infantile wombs, in which the limit should be 70 mm. The needles are round, full-curved, spear-pointed, and the well-known Emmet cervix and perineum needles.

Special Instruments.—For cauterization the Paquelin cautery and an electrocautery cone are required. The latter is in some respects the more satisfactory and reliable instrument. It is attached to the transformer connected with the electric light plant, by a plug in the wall; if the current is direct, a motor is needed in addition to the transformer. The electrocautery gives a more intense heat than the Paquelin, is not cooled so quickly when brought in contact with bleeding and secreting surfaces like a cervical cancer, and will not fail the operator in the midst of an operation, as the Paquelin sometimes does.

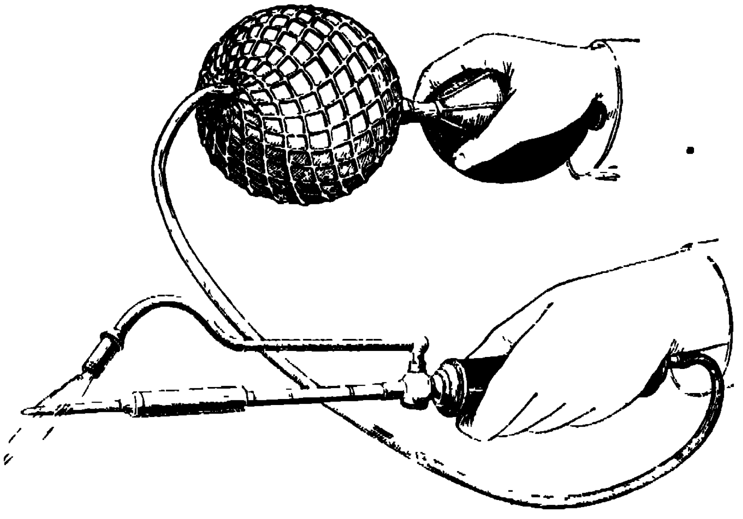

Fig 505 —Thermocautery

The electrothermic hemostatic clamps of A J. Downes are an indispensable part of a complete equipment for abdominal and pelvic surgery. They are most useful for clamping a broad ligament which is not infiltrated or thickened, for the slender stump of a pedunculated tumor, and for the hemostasis of the broad ligament in malignant growths of the uterus.

For an ovarian or other cystic tumor a trocar is usually provided, but personally I rarely use it, preferring puncture by a knife.

Two specially constructed catch forceps are convenient for

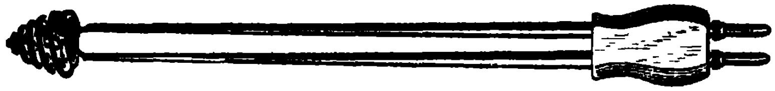

Fig. 506.—Electrocautery point.

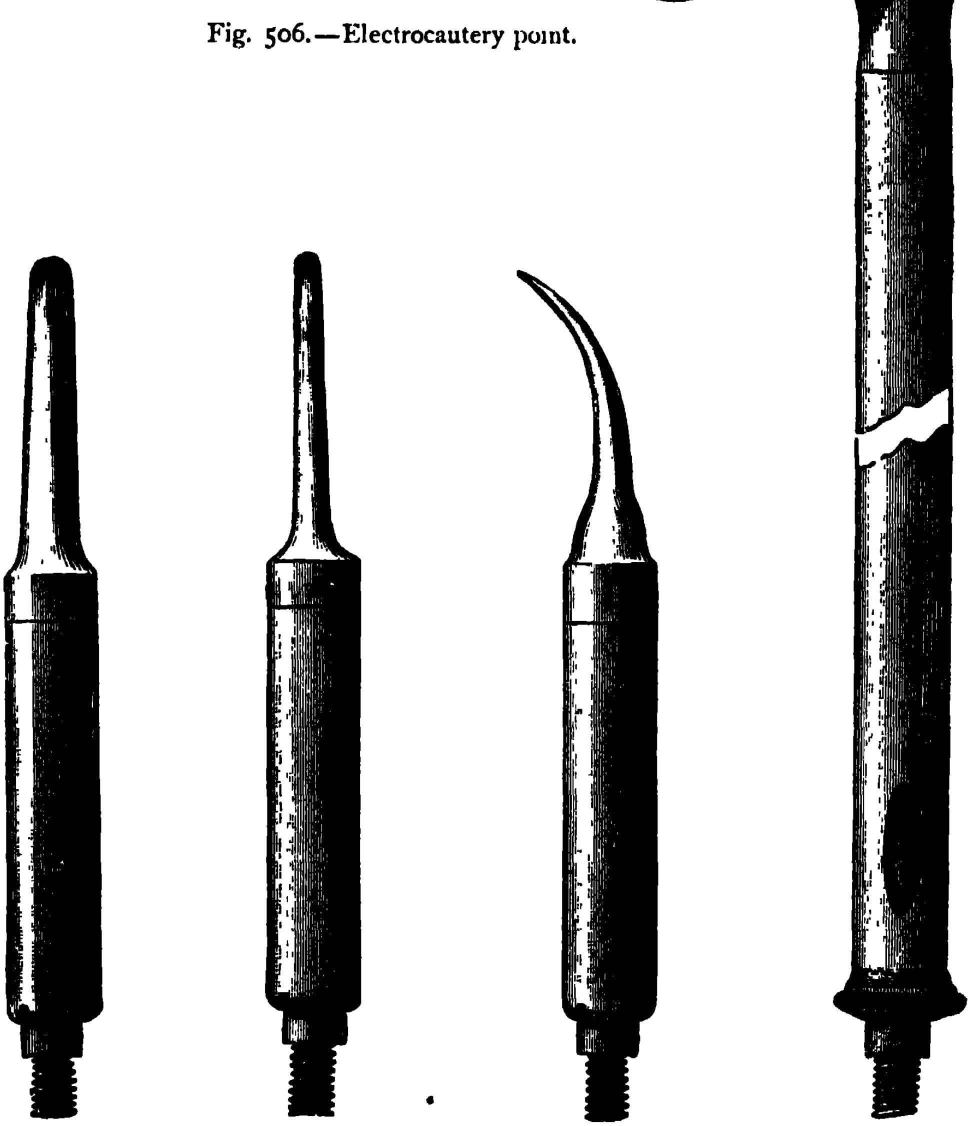

Fig. 507.—Thermocautery points.

seizing the walls of an ovarian cyst after it has been incised and for pulling the tumor out of the abdominal wound.

For a large fibroid tumor a heavy volsella forceps is needed to make traction on the tumor and to steady it

It is convenient to have an instrument tray divided into compartments for the different instruments, so that the assistant can lay his hands on what he wants without delay. There should be a separate pan for the suture material and needles.

All the instruments except the knives are boiled for half an hour. The knives, with their blades wrapped in cotton, are dropped in the boiling water for the last five or ten minutes. A small piece of washing-soda in the water keeps the instruments from rusting. The silkworm-gut for suture material is also sterilized by boiling water, but it can not be boiled in the water with the instruments, for the soda makes it soft and brittle.

Dressings and the Packing of the Autoclaves.—The cage of one autoclave is packed from the bottom up with the following materials in regular order for an abdominal section:

Packing Cage for Autoclave No. 1.—One abdominal binder of outing flannel; 4 pieces absorbent cotton; 12 pieces of gauze; 1 book of silver foil; 12 towels, 2 tubes of silk; 1 glass tube filled with six-inch gauze bandage for packing, also a three-inch rolled bandage; 4 sheets, 3 gowns; 3 caps, or squares of gauze for the head; 3 nail brushes.

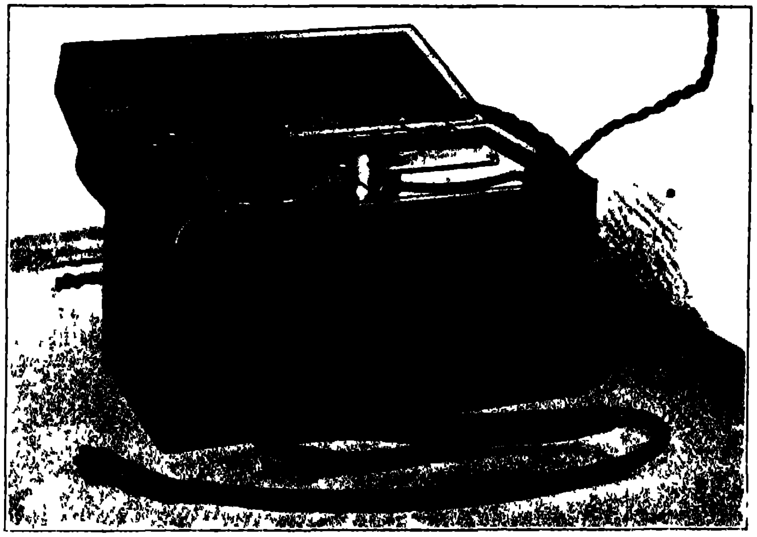

Fig 508 —Transformer for electrocautery point and Downes' forceps.

The second autoclave without a cage is packed from within outward, as follows:

Autoclave No. 2.—Three small basins; 1 package wrapped in gauze, containing fifteen pads for sponges; 1 pan for sutures and needles; 2 small white enameled pitchers; 1 tube of catgut, 3 nail brushes; jar of alcohol with tight screw-cap (to wash abdomen with); bottle of glycerin for rubber gloves; small jar of olive oil for Downes' clamps.

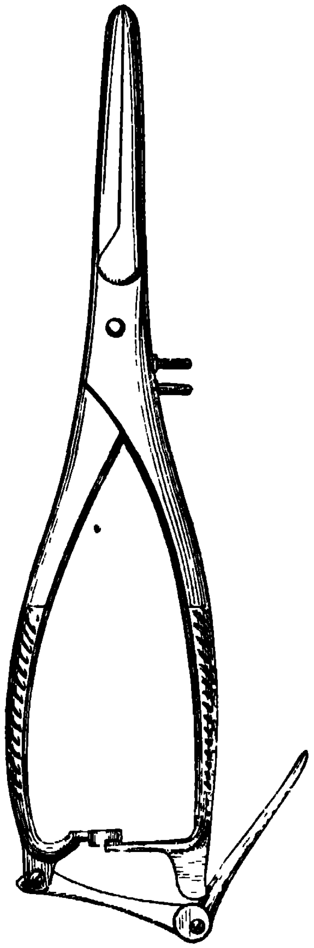

Fig. 509.—Downes' electrothermic hemostatic clamp

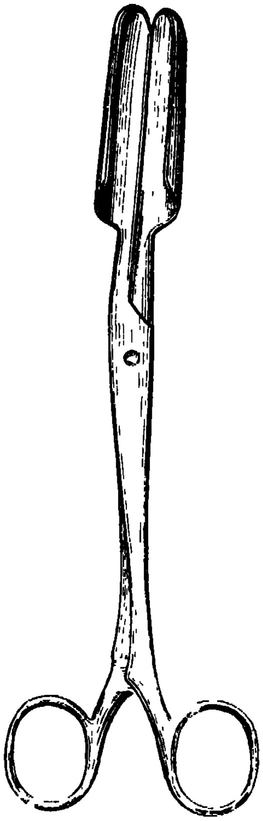

Fig. 510.—Protector for electrothermic clamp to guard adjacent tissues from the heat

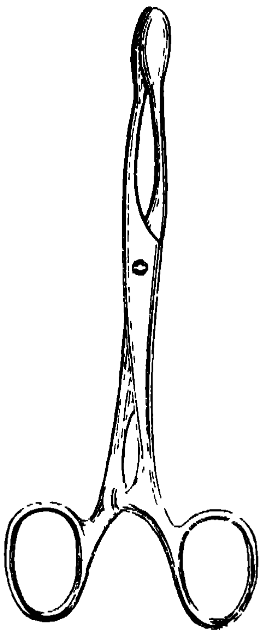

Fig. 511.—Author's catch forceps for wall of cystic tumor

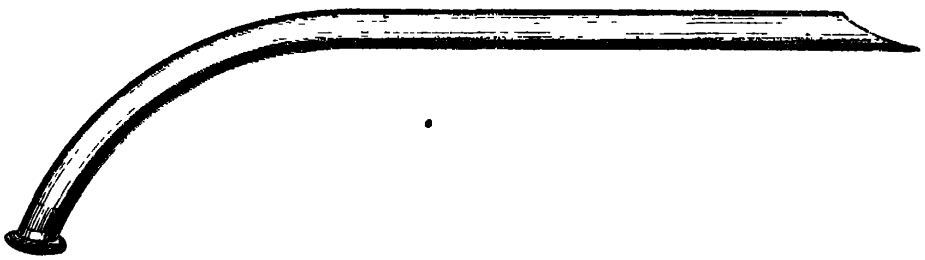

Fig. 512.—Trocar for cystic tumors

The gauze pads are provided in an invariable number. I use fifteen: one large, 9 × 9 inches; seven medium, 4 × 4 inches; and seven small, 3 × 3 inches, in sixteen to thirty layers. By using an invariable number the nurse who prepares the package has no excuse for a mistake in this respect, and by making this number as small as practicable, time and trouble are saved in the final count of the pads.

For a plastic operation the following articles are omitted from the autoclaves: From No. 1, the abdominal binder, tubes of silk, pieces of gauze, and the silver foil; a fenestrated sheet is added. From No. 2, the gauze pads. For plastic operations sea sponges are preferable and are safe if soaked over night in a 1 : 1000 sublimate solution. They are used once only.

Sutures and Ligatures.—Cumol and formalin catgut, silkworm-gut, and the two smaller sizes of Tait's twisted Birmingham silk are the materials required for sutures and ligatures.[1]

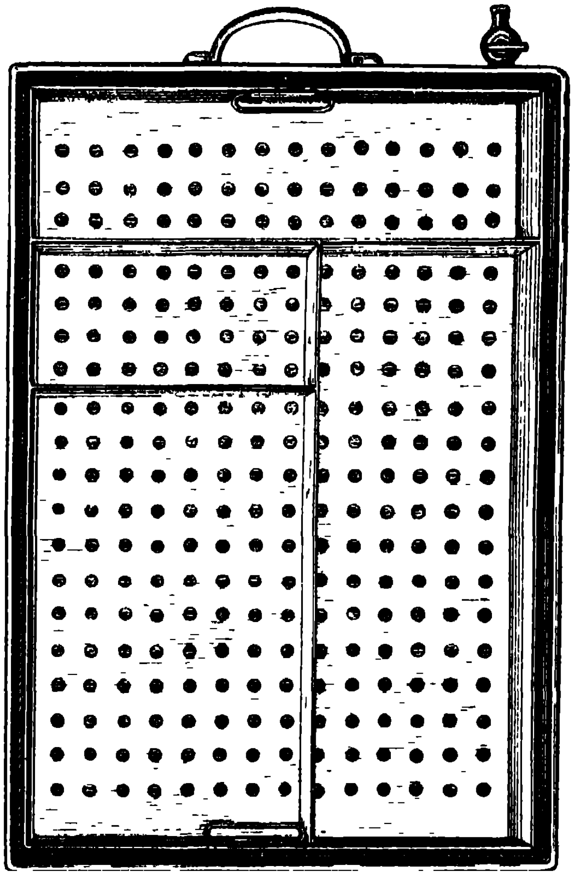

Fig 513 —Instrument tray divided into compartments

Cumol gut has the advantages of great tensile strength and a very short durability. It is the ideal ligature, therefore, in all septic and infectious cases, as it is desirable to have it disappear as soon as possible after 48 hours. It was first prepared by Krönig, whose process was modified and improved by Clark and Miller. The process is conducted as follows: Krönig's method: (1) Roll the catgut in rings. (2) Dry it in a hot-air oven or over a sand-bath for two hours at 70° C. (3) Heat it in cumol to a temperature (165° C.) a little short of the boiling-point, for one hour. (4) Transfer it to petroleum benzine for permanent preservation, or, if desirable, leave it in benzine for three hours, and transfer to sterile Petri dishes. A bacteriological study of this method by Clark and Miller shows that the sterilization is perfect, but that the transference from boiling cumol to benzine is open to serious objection. Clark and Miller found that benzine is not a germicide; also that it can not be

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[1] Kangaroo-tendon is no stronger or more durable than properly prepared catgut and is more difficult to sterilize Iron dyed (black) ligatures are recommended because they are more easily visible. I do not find them necessary.

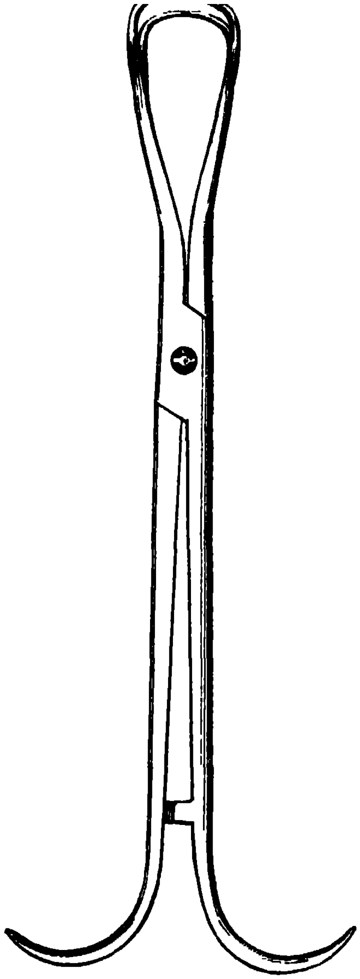
Fig 514.—Heavy volsella forceps for fibroid tumors.

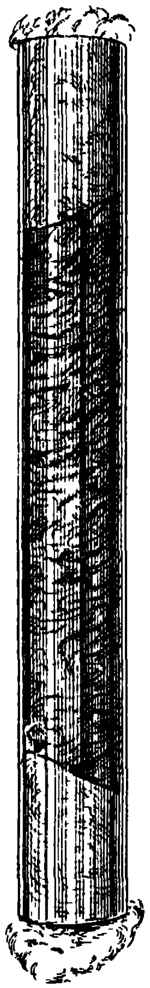
Fig 515.—Gauze bandage packed in glass tube stoppered with cotton

Fig. 516.—Cumol gut in sterile tube.

rendered sterile by heat without danger, and, therefore, modified Krönig's method as follows: (1) Roll the catgut, twelve strands, in figure-of-eight form, so that it can be slipped into a large test-tube. (2) Bring the catgut up to a temperature of 80° C., and hold it at this point for one hour. (3) Place in cumol, which must not be above 100° C., raise it to 165° C., and hold it at this point for one hour. (4) Draw off the cumol, and either allow the heat of the sand-bath to dry the catgut, or transfer it to a hot-air oven, at a temperature of 100 C., for two hours. (5) Transfer the rings with sterile forceps to test-tubes previously sterilized. In drying or boiling, the catgut should not come in contact with the bottom or sides of the vessel, but should be suspended on slender wire supports, or placed upon cotton loosely packed in the bottom of the beaker glass.

Formalin gut prepared as described below has the advantage of no handling in the course of preparation, absolute sterility as it comes from the autoclave, boiled in glycerin and alcohol at 240° F., and a durability of three weeks. If the cap of the metal tube is not provided with a good washer and is not screwed tight, the gut is ruined.

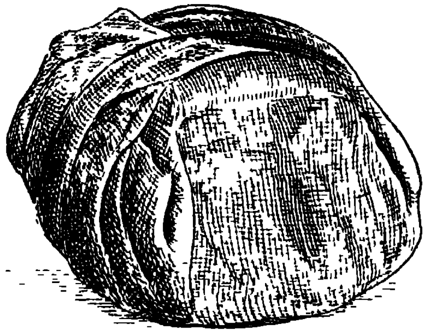

Fig 517.—Gauze pads (fifteen) wrapped in sterile gauze package.

Preparation of Formalin Catgut (Sizes 0 and 3).—Soak twelve hours in benzine; dry twelve hours on blotting paper; put in cold sterile water for two hours, rolled loosely on some cylindrical object, then in a solution of 1 : 20 formalin for sixteen hours; rinse off thoroughly in running water and stretch tight on a wooden frame to dry for four or five days. The frame is placed in a clean pillow-case to keep it from accumulating dust. The catgut is cut off in sutures thirty-six inches in length, rolled on wooden spools, five fine, five coarse strands on each spool; put in metal tube in absolute alcohol nine parts, glycerin one part, with cap screwed on as tightly as possible.

Preparation of Silk.—Tait's Birmingham silk: sizes medium and fine, cut in sutures thirty-six inches in length; three strands rolled on a glass spool; one spool of fine and two spools of medium size, put in a glass tube, the end being plugged with cotton; sterilize in autoclave, at temperature 240° F. for forty-five minutes, then dry in a hot-air oven one hour, temperature 150° F. The tubes are kept plugged in a glass jar, ready for resterilization in autoclave for each operation.

The silkworm-gut should be the thickest and strongest sold in the shops. The strands are, therefore, rather short. The longer the strand, as a rule, the more fragile the gut. Silkworm-gut is sterilized in boiling water, for ten to thirty minutes. The water should have no soda in it.

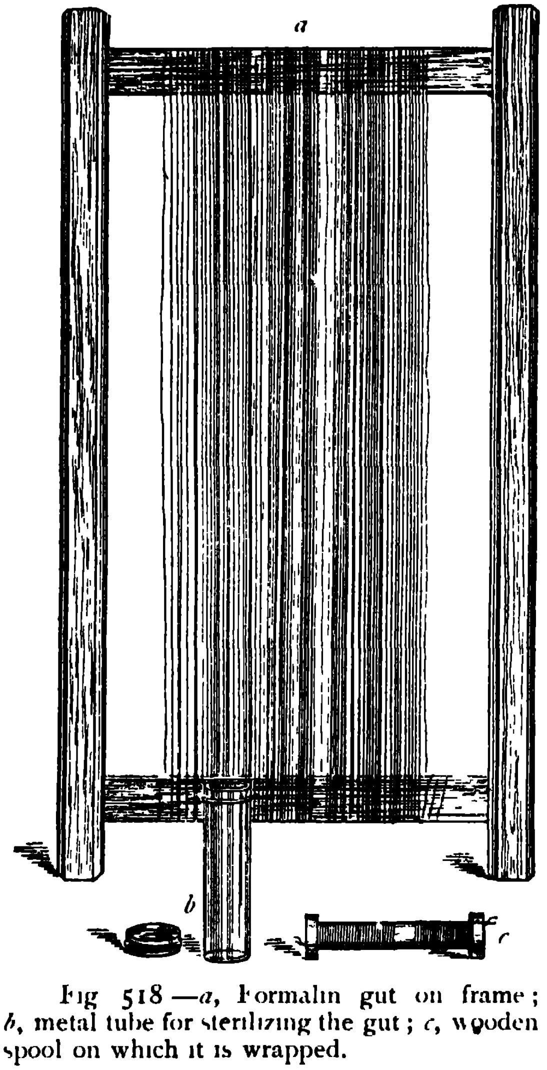

Fig 518.—*a*, Formalin gut on frame; *b*, metal tube for sterilizing the gut; *c*, wooden spool on which it is wrapped.

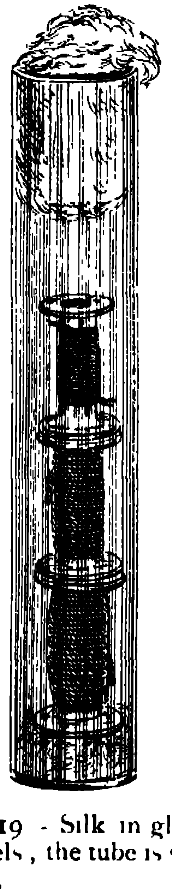

Fig 519.—Silk in glass tube, on glass reels, the tube is stoppered with cotton.

The Preliminary Treatment and Examination of the Patient.—A woman should be in the hospital forty-eight hours before operation. On entering, if she is a ward patient, she takes a full bath, superintended by a nurse. Her heart and lungs are examined. The total amount of urine is collected for the twenty-four hours, and on two successive days is examined for albumin, sugar, casts, specific gravity, and urea percentage (by Doremus' apparatus). The blood is examined for the number of red and white corpuscles and for hemoglobin percentage.

The existence of a drug habit should be ascertained, if possible. If sedatives or stimulants have been habitually taken, they must be continued in diminishing doses for several days after the operation.

If there is evidence of kidney disease an operation of election should usually be postponed until dietetic and eliminative treatment has brought about a marked improvement in, or an entire disappearance of, the symptoms. If there is no decided improvement, the operation should not be undertaken. In an operation of necessity the risk of uremia or diabetic coma must be incurred, although, if possible, time should be allowed for some improvement by treatment. The risk of uremia is not great with proper precautions in the use of anesthetics. The risk of diabetic coma is considerable. Noble's collected statistics show a mortality of 24.28 per cent. in 70 cases operated upon with sugar in the urine [1] Beyea reports a case of ovarian cyst in which sugar disappeared from the urine after the operation.[2]

If there is evidence of leukemia no operation should be undertaken if it can possibly be avoided A leukemic subject does not stand the prick of a hypodermic needle well A temporary leukocytosis naturally does not forbid an operation, but is, on the contrary, frequently a positive indication for it. Anemia is unfavorable for operative work. A hemoglobin percentage below 30 is said to contraindicate anesthetization, but in fibroid tumors, in other causes of metrorrhagia, and in sepsis, a capital operation must sometimes be undertaken with a percentage as low as 10. Treatment should be instituted, if possible, to improve the blood condition before the operation; just before anesthetization there should be a submammary injection of a pint of normal salt solution under each breast and a hypodermatic injection of digitalis and strychnia the anesthetic should be given in as small amounts and for as short a time as possible; hemostasis in the operation should be perfect, and the utmost celerity consistent with good work is essential If there is cardiac disease it is often an anxious question whether an operation should be attempted. If compensation is good and there is not much dilatation, the cardiac condition should give the operator little concern. Preliminary treatment with strophanthus or digitalis and complete rest is often advisable. After the operation cardiac stimulants are given routinely only in case of rapid, feeble, or irregular heart-action. There is danger of overstimulating the heart if the operator allows himself to become too apprehensive because he is aware that a cardiac lesion exists.

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[1] Three deaths from sepsis, 5, cause not stated, 9 from coma. (Personal communication.)

[2] "Tr. Gyn. Sect., College of Physicians," vol. v

An acute inflammatory process in the lungs is naturally a contraindication to an operation. In incipient tuberculosis, however, an operation of election may be deliberately undertaken with the object of increasing the patient's activity and ability to move about in the open air.

The medicinal treatment routinely prescribed for all patients about to be operated upon in the author's clinics is as follows: A pill of strychnia (gr. $\frac{1}{20}$) and digitalis (gr. $\frac{1}{2}$), t. i d.; 2 drams of Rochelle's salts in a tumbler of water the evening after admission; 15 grains of sulfonal at 5 o'clock the afternoon before operation; at 9 P. M., half an ounce of Epsom salts in a tumbler of water, followed the next morning by a simple enema, or, if there is to be a plastic operation, by repeated enemata till the lower bowel is empty.

The diet the day before operation is gruel for breakfast, soup for dinner, milk toast for supper; one glass of milk at 10 A M. and 4 P. M. The morning of the operation, at 7 o'clock, the patient receives 2 ounces of clear beef-tea

Hand and Skin Cleansing.[1]—There is no known method by which the human skin can be made sterile It can be so well cleansed, however, as not to be a dangerous source of infection unless the operator has contaminated his unprotected hands with some particularly virulent micro-organism, such as the streptococcus of purulent peritonitis. The question of the best method of hand cleansing is not now such an anxious one, as the surgeon must wear rubber gloves uniformly, no matter what system of skin cleansing he uses The insertion of the bare hand in a wound is unjustifiable in the light of our present knowledge. But the gloves may be pricked or torn during an operation, so that the hands under them must be made as clean as it is possible to get them. The skin must be freed of all superficial epidermis scales; the sebaceous matter must be removed not only from the surface, but from the crypts in the skin; the nails and palmar surfaces of the fingers should receive particular attention. The method should be as simple and uncomplicated as is consistent with the best results. Such a system, for example, as immersing the hands and arms in permanganate solution and then bleaching them in oxalic acid solution, when neither the permanganate solution nor the oxalic acid solution is an efficient germicide, is illogical, wastes time, and requires the preparation in bulk of two extra solutions which are unnecessary.

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[1] See "Händereinigung, Händedesinfektion, und Händeschutz," Haegler, 1900; and "Beitrage zur Handedesinfektionsfrage, Schaeffer, 1902.

The following system has been employed by the author for the last eight years because he believes it to be efficient and not too complicated and because the bacteriological examinations have shown as sterile a condition of the skin as is secured by any method. Three sterile basins, three small, two large glass dishes, and a tub (for sublimate solution) are provided. Six brushes are sterilized in the autoclave. The three basins, each with a small glass dish of tincture of green soap beside it, are placed in a long trough, in front of which the operator and his two assistants stand side by side.

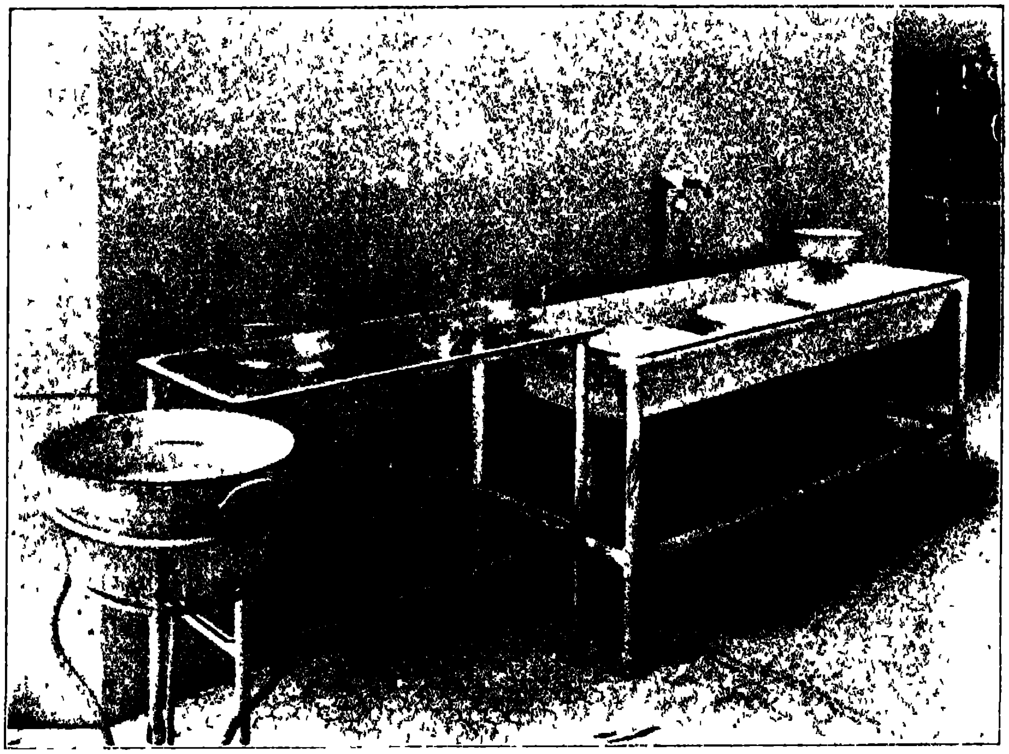

Fig 520.—Arrangement for hand cleansing. Three basins for sterile water, two glass dishes for benzine and alcohol, and tub for sublimate solution

The nails are cut short. The hands and arms to the elbow are scrubbed for ten minutes by the clock with sterile brush, tincture of green soap, and with four changes of sterile water, a nurse emptying the basins by catching them outside of and below the brim and filling them again with sterile water from a sterile pitcher (boiled in the implement sterilizer). Fresh brushes are then taken from the autoclave cage; the hands and arms are next scrubbed with benzine,[1] then with alcohol, and are finally immersed for a minute or two in a 1 : 1000 sublimate solution. The whole process lasts fifteen minutes. One cleansing ordinarily suffices for an operating day. Ten to twenty operations on six to eight patients in succession are performed with a change of gowns and gloves after each operation.

The Preparation of the Patient for an Abdominal Section.—*The Afternoon before Operation; Skin Cleansing.*—Prepare rubber gloves by wrapping in gauze and boiling for five to ten minutes. Clip pubic hair with clipper and shave with a safety razor. Sterilize the following articles for forty-five minutes at 240° F.: Two hand brushes for nurse, two soft-bristle brushes for patient; absorbent cotton, four small sheets, one-half dozen towels; gauze, unmedicated; gauze pad, binder; long-sleeved gown.

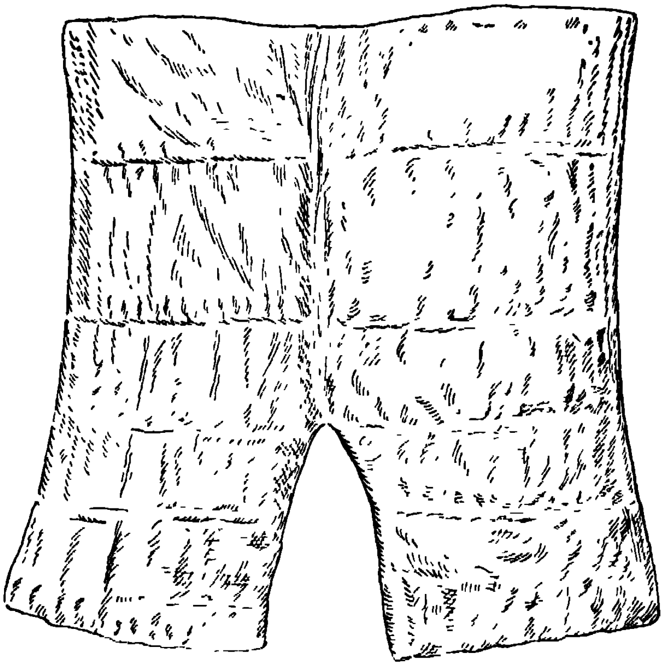

Fig. 521.—Gauze pad for patient's abdomen, extending part way down the thighs.

The nurse who cleanses the abdomen must prepare her hands and arms as though about to operate, namely: cut nails short; scrub hands and arms with brush, hot water, and tincture of green soap for ten minutes, with four changes of sterile water in sterile basin; clean nails with boiled nail file; with fresh brush scrub hands and arms with benzine and then with alcohol; immerse hands and arms in bichlorid solution (1 : 1000) for two minutes. Then put on the long-sleeved gown and gloves.

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[1] The quantity of sebaceous matter removed from the skin by this agent can be demonstrated by letting the benzine evaporate after the operator and his assistants have scrubbed their hands and arms in a pint or more of it. There is no other material so efficient for the purpose.

The abdomen, from ensiform to symphysis and from flank to flank and one-third the way down the thighs, must be scrubbed with soft-bristle brush, tincture of green soap, and hot water, thoroughly (for ten minutes by the watch, with four changes of sterile water), paying special attention to navel and to pubic regions. Scrub thoroughly with alcohol with the second sterile soft-bristle brush. Cover the abdomen with the sterile gauze pad, and put on the binder.

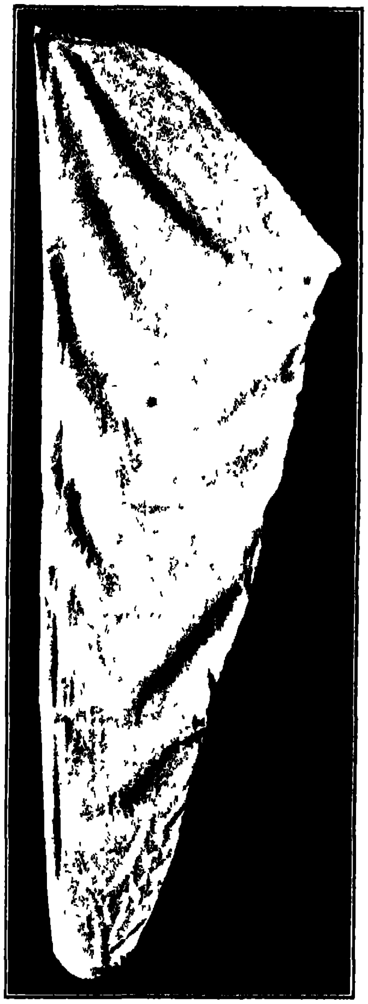

Fig 522.—Canton flannel legging

Morning of the Operation.—Give 2 ounces of clear beef-tea at 7 o'clock; give enema of pint of soapsuds, 1 dram of turpentine. Hands of nurse cleansed as described above. Articles resterilized as described above. Same cleansing of abdomen repeated as described above, but, in addition: before alcohol scrubbing, scrub abdomen with benzine, wring out the large sterile gauze pad in 1 : 1000 bichlorid solution, and cover the abdomen with it, put over it a thick layer of sterile cotton; apply binder. Catheterize the woman just before anesthetization with sterile glass catheter (in all cases of abdominal tumor the long silk or rubber catheter,[1] previously boiled, to be used) in aseptic manner. Give vaginal douche, 1 quart of 1 : 4000 solution, followed by a little sterile water. Pack the vagina with sterile gauze. Packing always to be removed in twenty-four hours at most or directly after the operation.

The patient is dressed for the operation in Canton flannel leggings covering the feet and reaching to the hips, and in a short gown, open down the back, reaching only to the hips.

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[1] In cases of abdominal tumor the bladder is sometimes sacculated or lifted high into the abdomen, and a short catheter will not evacuate it.

The Preparation of the Patient for a Plastic Operation.—*Evening before.*—Sulfonal, gr. xv, at 5 o'clock, in one-half glass of boiling water, cooled down to drinking-point. Epsom salt, one-half ounce in tumbler of water at 9 o'clock.

Morning of Operation.—Cup of beef-tea at 7 o'clock. Enema of soapsuds and turpentine. Irrigation of lower bowel by repeated injections, until it is completely emptied. Wash pubis and labia with gloved hands, tincture of green soap, hot water, and pledgets of sterile cotton. Shave pubis and labia. Wash out vagina with tincture of green soap and pledgets of cotton. Give douche of 1 : 4000 bichlorid solution followed by sterile water; tampon vagina with sterile gauze. Catheterize patient just before anesthetization with sterile glass catheter in aseptic manner.

If a vaginal tampon is inserted after an operation, it must never be left in longer than twenty-four hours, except by order of the chief. Douches after a plastic operation to be given only by order of the chief. The number of stitches to be removed must invariably be noted on the chart.

The Preparation of the Surgeon; Clothes, Gowns, and Gloves.—Three suits of cheviot shirt and duck trousers or pajamas are folded neatly, wrapped in a towel, which is pinned securely Each bundle is marked with the names of the operator and his two assistants, is sterilized in the autoclave, and placed in the dressing room adjoining or near the operating room. Canvas shoes with rubber soles are also provided The operator and his assistants change all of their outer clothes and shoes The gowns must have long sleeves down to the wrist, fitting snugly so that they will not ride up during the operation The rubber gloves should have gauntlets, to turn up over the wristbands of the gowns. No skin surface of the operator or his assistants shall be exposed The head is tied with a triangular piece of gauze, to cover the hair and to catch the perspiration from the forehead. It is a sensible practice to cover the nose and mouth with a strip of folded gauze tied around the back of the neck. Edebohls' experience of fatally infecting a patient's wound because he had incipient diphtheria would justify this practice as a routine measure, but it is so uncomfortable that the author only resorts to it if he has a cold, sore throat, or feels indisposed. The gloves are sterilized by boiling for ten minutes: each pair is wrapped in a piece of gauze. They are spilled from the vessel in which they have been boiled into a tub of sterile water. Sterile glycerin is poured into the gauntlet to facilitate the insertion of the hand. They are rinsed off in a bichlorid solution (1 : 1000) after they are put on. In putting them on, the fingers and palmar surfaces are not touched. They are held by the gauntlets and wrists. Extravagance in the matter of gloves is essential to a good technic. Six pairs are prepared for every operation, so that a change is provided for the operator and two assistants in the midst of the operation if it is desired. Twelve pairs at least are needed for a busy operating day, those not in use being boiled, and the tub being constantly supplied with an ample number for repeated changes.

Anesthesia and Anesthetics.—Anesthesia means etymologically the loss of tactile sensibility. It is a local or constitutional condition induced to avoid or control pain, to relieve spasm, and to facilitate surgical operations.

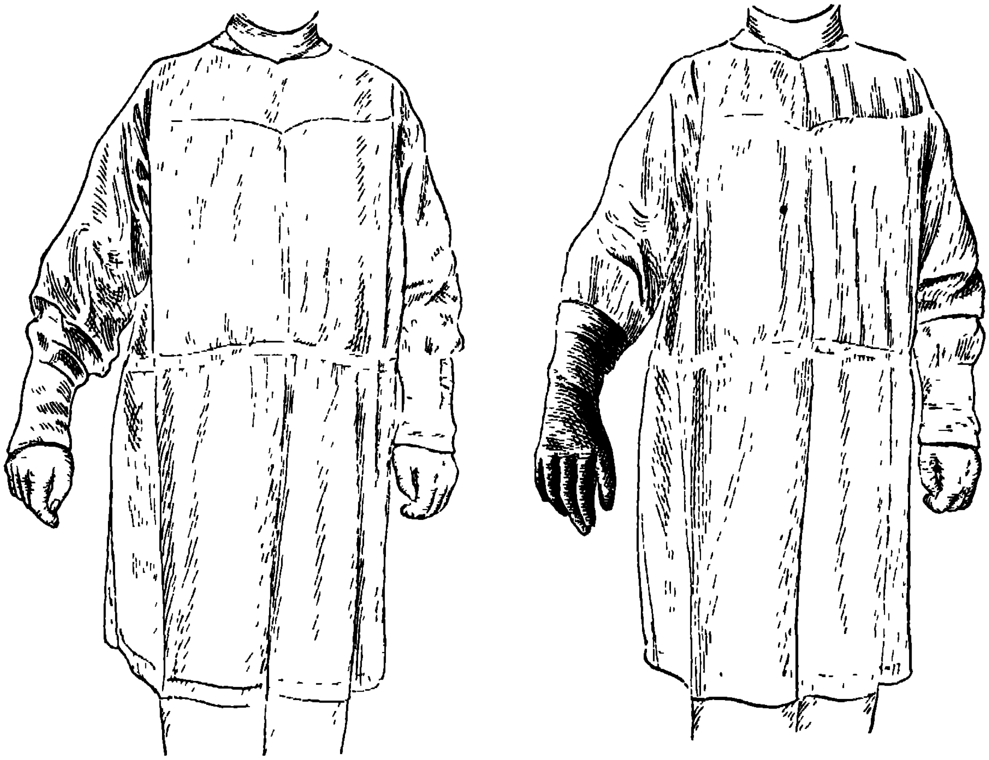

Fig. 523.—*a*, Long-sleeved gown; *b*, the same, showing glove with gauntlet turned up over wristband of gown.

Of a large number of local anesthetics, but three are widely used—ethyl chlorid, eucain, and cocain.

Ethyl chlorid is kept in closed tubes, with adjustable valves. When the valve is opened, the liquid escapes in a fine spray and by rapid evaporation freezes the skin. Its use is limited to minor short operations, as opening boils and extirpating wens.

Cocain is readily absorbed by mucous membranes, but to anesthetize the skin it must be given hypodermatically. It paralyzes the peripheral nerve-endings, is used in solutions up to 20 per cent., and is the best local anesthetic. Its use should be confined to minor operations, however, except in the very few cases where all constitutional anesthetics are positively contraindicated, as in grave heart or kidney disease. One grain in solution injected into the spinal arachnoid space posteriorly at the middle of a line joining the crests of the ilia anesthetizes everything below the waist-line, and if done aseptically is reasonably safe, successful, and occasionally justifiable. As a local anesthetic cocain is of great service. Its principal use in gynecological operations is in dilatation of the cervix and primary perineorrhaphy One-eighth grain cocain hydrochlorate in solution injected in each side of the cervix permits its dilatation with little or no discomfort. A pledget of cotton saturated with 4 per cent. solution of cocain and placed in the sulcus of any fresh perineal tear makes its primary repair after two minutes practically painless Even a complete tear may be repaired by this method.

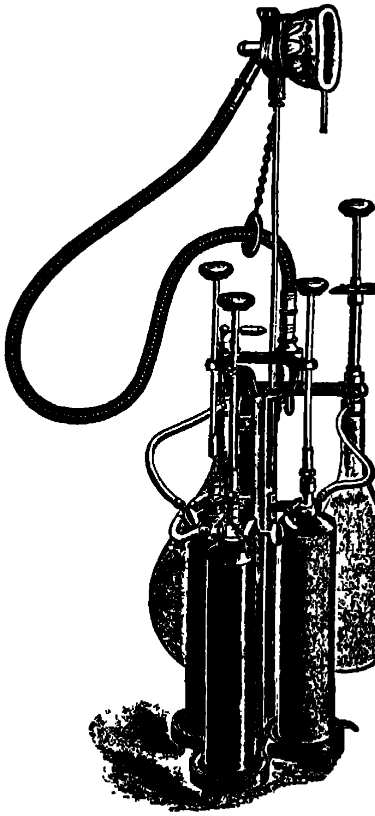
Fig 524 —Apparatus for administering nitrous oxid gas and oxygen.

Eucain acts like cocain, but is less dangerous, of more lasting effect, and is not decomposed by boiling. It is, however, less certain in its effect and must be used in twice the strength. Its chief use is for infiltration-anesthesia in a solution composed of β-eucain, 0.1; NaCl, 0.8; water, 100 To avoid poisoning from cocain or eucain, not more than one grain of the former or two of the latter should be injected at once. If poisoning does occur, whisky, digitalis, aromatic spirits of ammonia, and strychnin are indicated.

For minor operations, such as curettage and primary repairs, an admirable method for both patient and surgeon is that of combining laughing gas and oxygen. For this purpose the S. S. White Dental Company, of Philadelphia, furnishes a convenient apparatus. A metal stand (Fig. 524) supports two cylinders of gas and one of oxygen. One gas cylinder is used and the other kept as a reserve in case the valve of the first becomes obstructed or the cylinder becomes empty after being used a number of times. As the gas and oxygen are allowed by valves to escape from their elastic receptacles into a common tube, they can be mixed in any desired percentage up to ten, according to the indicator on the oxygen side. Pure oxygen can be given by closing the control valves on the gas side. The best plan is to give the patient pure gas until the first appearance of cyanosis, with muscular or respiratory disturbance, then to admit oxygen in just sufficient amount to give the patient a healthy pink color. By carefully regulating the mixture of oxygen and gas the patient can be kept perfectly quiet and safely anesthetized for half an hour or more. When the surgeon announces that the operation is finished, the gas is turned off and the patient is allowed to inhale a few breaths of pure oxygen. The instant the inhaler is removed, the patient often smiles and answers questions with perfect composure.

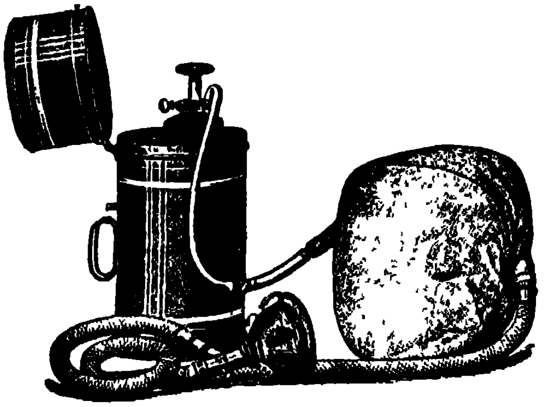

Fig. 525.—Portable apparatus for nitrous oxid gas.

The best method of producing constitutional anesthesia is to begin the anesthesia by hyponitrous oxid and to continue it with ether. Ethyl chlorid and chloroform have been substituted for the gas, but they are more dangerous than gas and ether. We have given ethyl chlorid a thorough trial. It takes twice as long to produce the same results as the nitrous oxid gas, and it is followed sometimes by long-continued and violent vomiting. It has the advantage of being much more easily portable than the gas apparatus, so that we use it in preference sometimes in private houses. It is probably safer than chloroform, though the statistics include a very large number of cases in which it was used for only a few moments in dental operations.[1] With mixed anesthetics we have as yet no experience. Mixtures of alcohol, chloroform, and ether (A. C. E. mixture in proportion of volume 1, 2, 3), chloroform and ether, and chloroform, ether, and benzine (Schleich) have been advocated, but they do not appeal to our reason. The most sensible proposition on these lines has been made by Willy Meyer,[1] following Schleich's reasoning: A mixture is made of chloroform, 43.25, and ether, 56.75 parts by volume; 83 parts by volume of this mixture and 17 parts of ethyl chlorid give an anesthetic mixture (anesthol) with a boiling-point of 104° F., or nearly that of the body-temperature. This mixture is absorbed and eliminated with equal facility, and therefore, it is claimed, is safer than any one of its component parts alone.

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[1] See "Ethyl Chlorid as a General Anæsthetic," W. J. McCardie, London "Lancet," April 4, 1903. Seitz's statistics of 1 death in 16,000 administrations are quoted. There is a useful table of the comparative danger of the anesthetics in common use. They rank in this order: nitrous oxid gas, ethyl chlorid, ether,

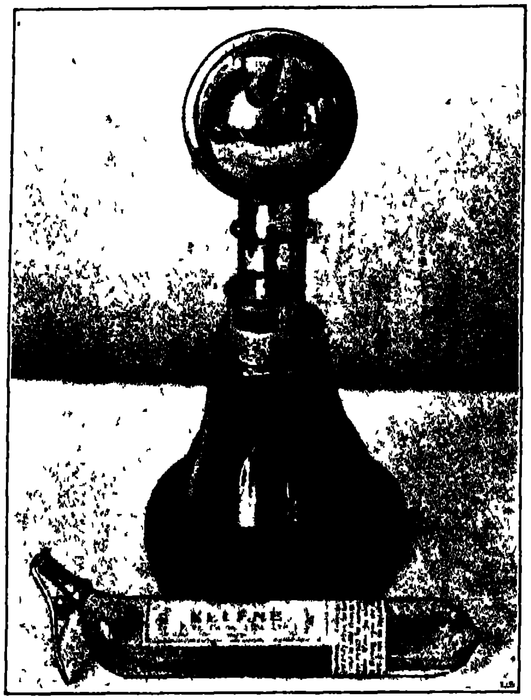

Fig. 526 —Mask and tube for ethyl chlorid.

For general use a portable gas apparatus is desirable. The best apparatus for this purpose is shown in figure 525. It comprises a filled cylinder containing one hundred gallons of nitrous oxid gas, an elastic receptacle, tube, and inhaler. The inhaler has a pliable metal frame lined with soft rubber and surrounded by a pneumatic tube which allows its close approximation to the face The inhaler has an inspiratory and an expiratory valve and a

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chloroform, and bromid of ethyl The last has such a high mortality that its use is scarcely justifiable.

[1] "Jour. Am Med. Assoc.," Feb. 28, March 7, 1903.

thumb spring valve to control the gas. When the cylinder valve is opened by a thumbscrew, the liquid vaporizes as it escapes into an elastic receptacle. This makes the administration constant and regular. One cylinder is sufficient, generally, to anesthetize ten patients. When a cylinder has been used a number of times, however, it is always well to have attached a reserve cylinder which may be emptied into the same receptacle, so that when one cylinder is empty the anesthesia will not be interrupted.

The patient must be in a recumbent posture and have nothing loose in the mouth. All obstructions to free respiratory movements must be removed, and there should be a good light so that the patient's color and movements may be quickly and accurately observed. The patient's heart is superficially examined, not only to test its action, but also to gain her confidence. She should be assured that there is no danger, but that she will simply fall quietly to sleep. With quiet, deep breathing, the anesthesia may be easily, quickly, and safely induced. It has been claimed that certain patients are not susceptible to nitrous oxid. Upon investigation it is found that the inhaler leaks or that the mouthpiece does not fit, and that the patient is getting enough air with the gas to delay the anesthesia indefinitely. Nitrous oxid is not anesthetic if atmospheric air is present in a quantity of 5 per cent. If any oxygen whatever is inhaled with the gas, the anesthesia will be delayed proportionately.

The inhaler should be tightly pressed to the face so that the patient inhales gas only, of which the receptacle must be kept full. The respirations will be accelerated and become irregular. The pulse, at first, is generally exaggerated in frequency and lessened in force on account of excitement, but as the inhalation proceeds the heart-beat rapidly becomes strong and slow. The peripheral vasomotors are the first to be stimulated, and as the vessels contract there is a momentary blanching of the skin, a diminution in vascular capacity, a slight increase in resistance, and a consequent increase in frequency of the pulse. The peripheral vasomotors are almost immediately paralyzed, resistance is lessened, and the pulse-frequency is greatly diminished. By this time the heart itself is stimulated and for that reason beats more forcibly.

The fact that arterial tension is only very slightly exaggerated makes the method so far reasonably safe.[1] Nitrous oxid is not in the least dangerous if it is not pushed too far, but the administrator should know when to stop it.

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[1] I have used it successfully upon two cases of aortic regurgitation, one of aortic stenosis, six of mitral stenosis, twelve of mitral regurgitation, three with double mitral lesion, and upon a large number of elderly patients with hard arteries.—(B. F. Roller)

Consciousness and voluntary motion are lost after the first few inhalations, but when the ether is administered the patient rallies from the gas before the ether takes effect The gas should be pushed until three phenomena are observed: rapid and irregular breathing, spasmodic movements of the voluntary muscles, and a marked cyanosis.

H. C. Wood says nitrous oxid anesthesia is one of asphyxia. It is more probably due to a substitution of nitrous oxid for oxygen in the blood, forming nitrous oxid hemoglobin, which is blue The suffusion of blue blood in the peripheral vessels, on account of paralysis of the peripheral vasomotors, is responsible for the cyanosis, which is not, as many think, an evidence of cardiac failure. Marked cyanosis must occur. It generally appears in about forty-five seconds. It should not be alarming and must appear before the anesthesia is sufficiently advanced The rapid, irregular breathing and spasmodic movements of the voluntary muscles are the signals that the gas must soon be discontinued. If the gas is pushed further, the patient reaches the acme of stimulation, a universal tetanic spasm. This will be followed by paralysis of the heart and respiration centers, and the patient will die unless revived by artificial respiration. Therefore, when rapid and irregular breathing and spasmodic movements of the voluntary muscles appear, providing the patient is markedly cyanotic, ether must be immediately substituted for the gas.

In changing to ether, the simplest and most hygienic inhaler is clean gauze folded in forty-eight to sixty-four layers, five by six inches. With the gauze intact and unattended, the patient can be moved, the larynx and nasal alæ manipulated, the pupils examined, the pulse watched, and the conjunctivæ protected better and more easily than with any other inhaler Less ether is required because it can be poured directly over nostrils. Bronchitis is almost never produced, because the ether is vaporized and well filtered; the patient does not breathe over and over the same column of expired air, but gets plenty of fresh air. For these and other reasons the postanesthetic shock and nausea are very slight. Finally, by this method no infection is carried from one patient to another.

When the moment arrives to discontinue the gas, the gauze should be quickly thrown across the face and saturated over the nostrils with an ounce of ether. Ether is irritating, and its first inhalation, in addition to the gas stimulation, is sure to be followed by a spasm of the larynx. This may be somewhat lessened by a preliminary spray of adrenalin (1 : 5000) and cocain (1 : 50). A better procedure, however, is to facilitate breathing, as follows: Hook the third and fourth fingers of both hands behind the rami of the inferior maxilla and pull forward; at the same time, with the first and second fingers of both hands roll the skin and subcutaneous tissues up over the chin, elevating the hyoid and opening the larynx. Press laterally over the malar bones with the thumbs and open the anterior nares. With this manipulation the spasm passes off in a few seconds and the patient is etherized by the first three or four inhalations. By the time the patient is lifted to the operating table she is completely relaxed and ready for operation. The whole process up to this point requires on the average one minute and forty-five seconds.

Pushing the ether in this manner has been objected to, but it is not in the least dangerous. It makes no difference how fast the ether is given if it is stopped when the patient is sufficiently anesthetized To determine this, however, requires a comprehension of the physiological effects of ether They are represented diagrammatically by a curve, all bodily functions being stimulated increasingly to the acme. Then they are all gradually depressed, the early stage of depression being anesthesia and its termination paralysis. Fortunately, on account of a difference in susceptibility of the organic functions, some are affected earlier than others, and this fact affords a valuable clinical guide to the use of ether. The height of stimulation once passed, the depressing effects follow in regular sequence.

After consciousness is lost there are four distinct stages of anesthesia, each resulting from the paralysis of a definite group of nerve-centers and muscles. When the first group, which has to do with the voluntary muscles, is paralyzed, all motor power is lost and it is impossible to evoke contraction of a voluntary muscle The best indicators for this group are the orbicularis palpebrarum and recti muscles of the eye. Raise the upper lid. If the eyeball remains stationary, the recti are paralyzed. Let the lid fall, and if there is no winking and no elasticity the orbicularis is anesthetized. When these two are paralyzed, all the voluntary muscles are under control and the first stage is complete.

The pupillary muscles are the second group The pupil is controlled by two involuntary muscles of the iris, a circular sphincter, and a radiating dilator. The sphincter is stimulated first, and the pupil grows progressively smaller, though responsive to light, until, when the sphincter is paralyzed, the radiating muscle suddenly dilates the pupil. The dilator soon becomes paralyzed also, but the pupil, of course, remains large and stationary, and the second stage is complete

Early in the second stage, when the pupil is partly contracted, if ether is discontinued, the pupil dilates. This is because the sphincter, no longer stimulated and already overworked, is temporarily weaker than the dilator. The beginner is at a loss to know whether the patient is coming out of the second or going into the third stage. If the pupil is dilated, expose it suddenly to light. If it responds, she is reviving. If it is dilated and does not respond to the light, she has entered the third stage.

For all practical purposes the second stage is the most important. It is in this stage that the patient should be kept during major operations. Keep the pupil slightly contracted, but always reactive to light—*i. e.*, in the beginning of the second stage. At this point the patient is just enough anesthetized to meet all indications, but not far enough to be in danger.

The third group to be paralyzed by ether are the respiratory muscles and centers. If ether be pushed to dissolution, the respirations grow more and more shallow, abdominal, and finally cease. Early in this stage cyanosis appears from imperfect aeration, and paralysis of the respiration is followed rapidly by paralysis of the last group—the cardiac reflexes. As they are more and more depressed, the pulse becomes running and thready and suddenly stops.

It appears, therefore, that the pulse which was formerly the anesthetic guide is of no use to an etherizer except to show how the patient is standing the hemorrhage and operation. The reflexes are always depressed by ether in the above order. Since the first and the early part of the second stage are sufficient, the ether should not be pushed to the third or fourth stage, for it unnecessarily endangers the patient's life. Of course, in patients with diseased and unreliable pupils, the respirations must be used as the safeguard against too deep anesthesia. At the very first disturbance of respiration, the ether should be temporarily discontinued. After the patient is thoroughly anesthetized, it requires very little ether to continue the anesthesia, three or four ounces being ordinarily sufficient for any major operation.

Occasionally, patients, especially negroes, suffer a very annoying accumulation of mucus and saliva in the mouth and throat from ether. This does not occur with chloroform, and in such cases the anesthesia can be maintained much more comfortably by chloroform; but the postanesthetic nausea which a mixture of gas and chloroform produces is so extremely annoying that its use can not be recommended.

The choice of an anesthetic depends upon the conditions of each case. Cocain is the best local anesthetic, but its use in major operations should be limited to cases in which a constitutional anesthetic is absolutely contraindicated.

Chloroform acts much like ether, but is so much more powerful that it is considered treacherous and unsafe. Where the same anesthetic is to be used throughout, ether should be preferred, unless it be in negroes, who are very resistant to ether, but react perfectly to chloroform. The postanesthetic nausea, however, must not be forgotten. In all major operations where it is at all practicable, not only in hospital service and busy clinics, but in private houses, the best of all methods is the method by gas and ether described above. The entire method requires but a minute and a half to two minutes to anesthetize the patient sufficiently for major operations. It requires but a few inspirations of gas and three or four ounces of ether, and costs only about five cents more per case. It is not in the least unpleasant to the patient, and the postanesthetic effects are reduced to the minimum. It seems unquestionably the method to be preferred in all cases requiring deep anesthesia, and has no contraindications where a constitutional anesthetic can be used at all.

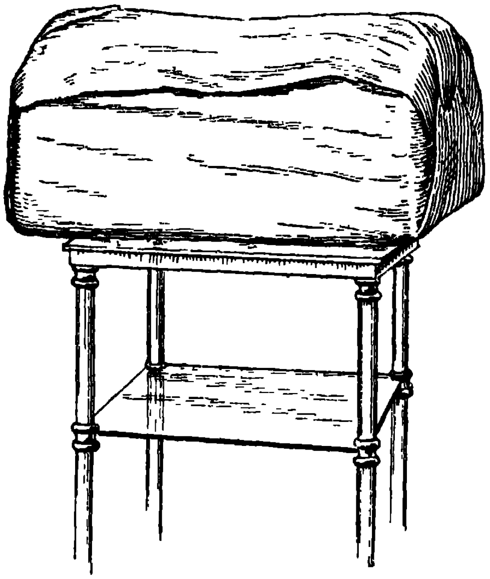

Fig. 527 —Cage removed from the autoclave wrapped in its sheet.

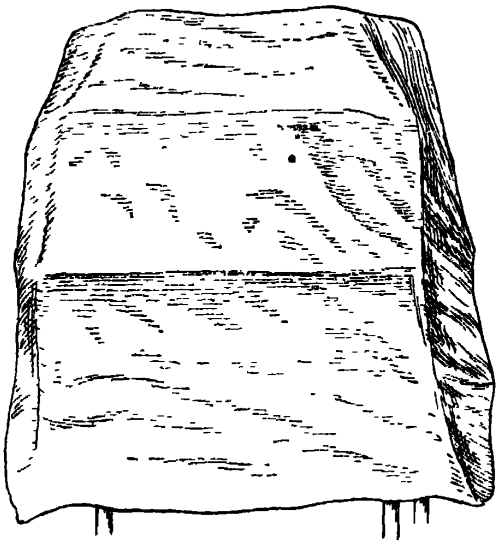

Fig. 528.—Sheet draped over the cage after the lid is raised.

The Technic of an Abdominal Section.—Arrangement of Tables and Instruments; Position of Assistants.—Two tables are required, one for instruments, one for the pads and their basins; each is covered with a sterile sheet. On another table the cage of the autoclave rests. It is so draped with a sterile sheet that it is always protected from contamination even though the lid is opened. Only the gloved hands of the operator or his assistants are inserted into it, a nurse raising the sheet over it while the hand is inserted, and dropping it immediately the hand is removed (Figs. 527, 528, and 529). Two sterile basins on stands are placed back of the operator and his first assistant. They are filled with sterile water to rinse the hands during the operation. As soon as the water is used for this purpose, it is changed by a nurse, so that it shall always be fresh. The operator stands on the patient's right side, his first assistant on her left, the second assistant stands at her knees. Two nurses are on duty in the operating room, but they take no part in the operation itself The author prefers to have his first assistant manage the pads, so as to concentrate responsibility as much as possible.

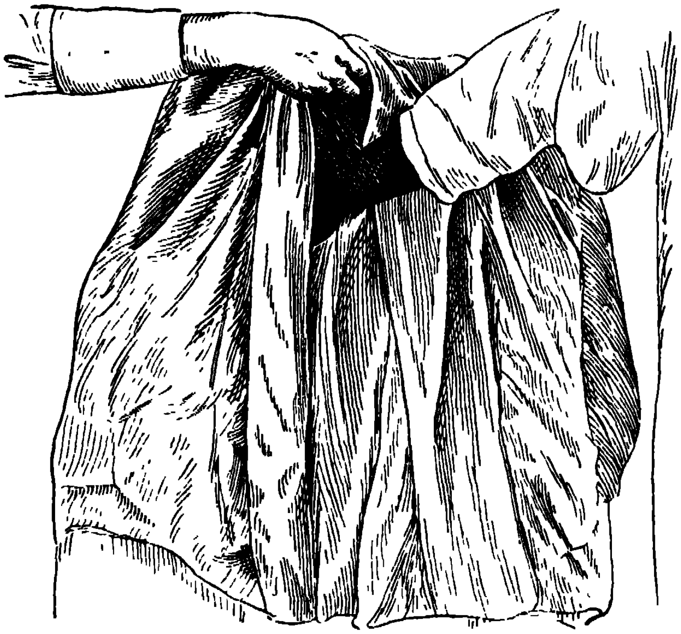

Fig. 529 —The operator inserting his hand in the autoclave cage for dressings, etc

Securing the Patient on the Table.—Straps are provided on the end of the table for the patient's legs just above the ankles Two pieces of gauze bandage are tied on the uprights at the head of the table, to tie around the wrists. The arms are flexed and the wrists are tied so that they are brought to a level with the shoulders. They are raised no higher for fear of paralysis, which will occasionally develop if the arms are pulled forcibly above the patient's head and are held there during an operation. This method is preferable to pinning the arms by the sleeves of the gown across the patient's breast, which interferes with her respiration. The author's table is provided with shoulder supports to keep the patient from slipping and to ease the strain on the knees in the Trendelenburg posture, but they are not used, as they are not found to be necessary and they interfere with the air-cushion on which the patient's body lies.

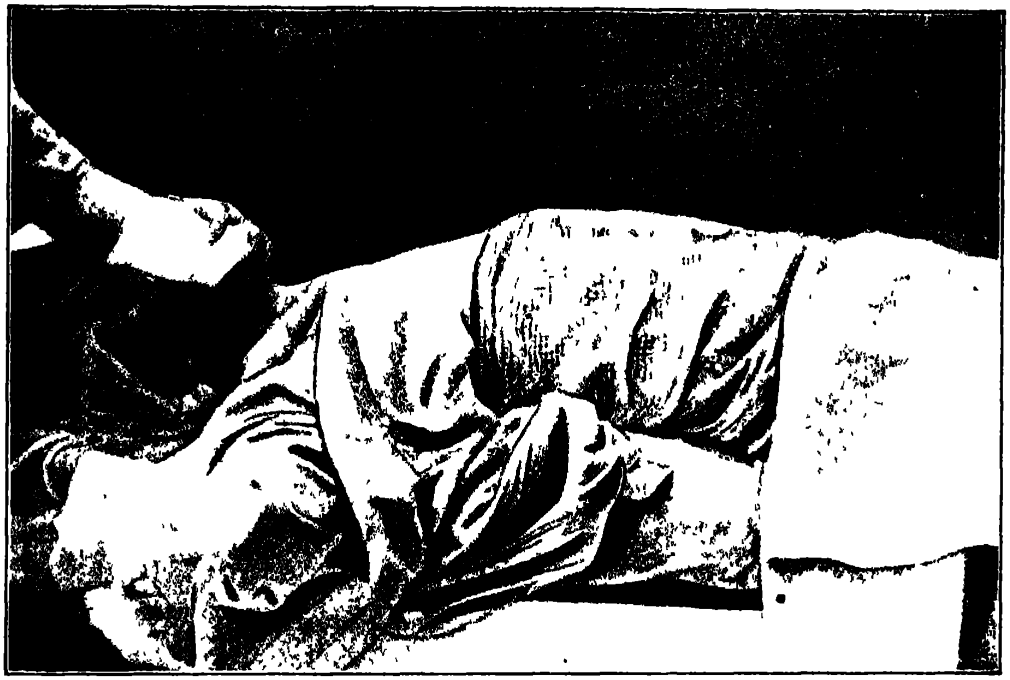

Fig 530 —Abdominal binder turned back, exposing the dressings.

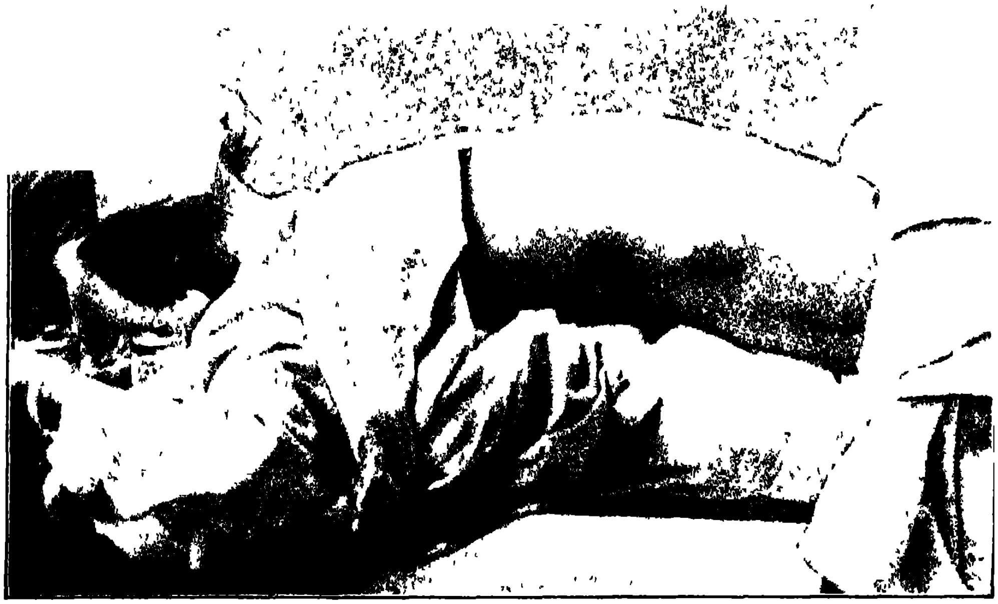

Fig. 531 —Abdominal dressings turned down over patient's thighs.

Preparing the Field of Operation.—The skin of the abdomen is prepared by two cleansings as already described. When the patient is secured on the table, a nurse loosens the binder and turns its tails back; she then turns the abdominal pad and the dressings down over the patient's knees, by catching its upper edge. The skin of the abdomen being exposed, the nurse pours some sterile alcohol (boiled) from a flask over the abdomen; the first assistant rubs the line of incision vigorously with a gauze pad for a moment or two. A piece of rubber-dam, 18 inches square, sterilized by boiling water, is spread over the abdomen, covering the symphysis and reaching two or three inches down the thighs. Murphy's adhesive rubber-dam is not satisfactory. It

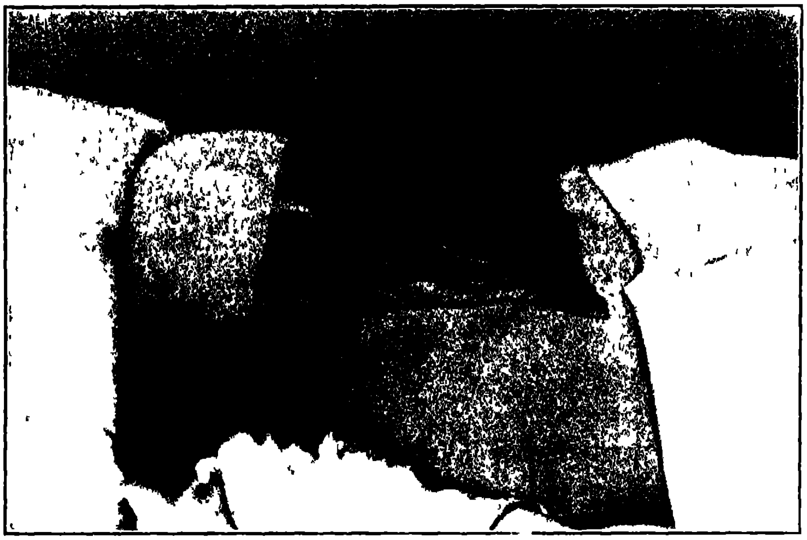

Fig. 532.—Rubber-dam spread over abdomen

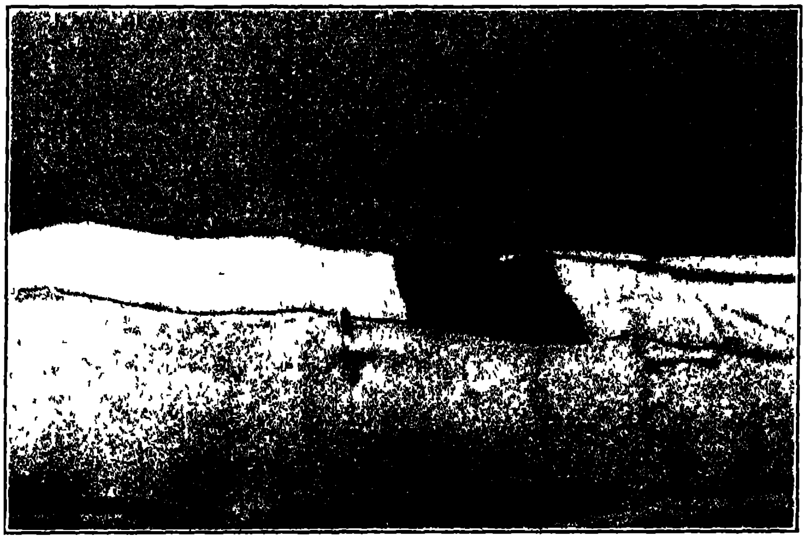

Fig. 533.—Towels pinned over rubber-dam, leaving no skin surface exposed.

is difficult or impossible to sterilize, it does not stick tight enough, and at the end of the operation it is rumpled or torn, not subserving its purpose of completely concealing and protecting the skin. Gutta-percha tissue made adhesive by pouring a little ether on the skin is open to the same objection. The principle of protecting the patient from infection from her own skin is correct, and should be uniformly adopted. The author's method of doing so has been found reliable and satisfactory in all kinds of abdominal operations. Over the rubber-dam a folded sterile sheet is placed, with its upper edge just above the symphysis; another one is spread over the thorax, reaching to or below the umbilicus. A towel is spread over each sheet and tucked under the edge; two towels are laid over the flanks; the four towels are pinned together with sterile safety pins.

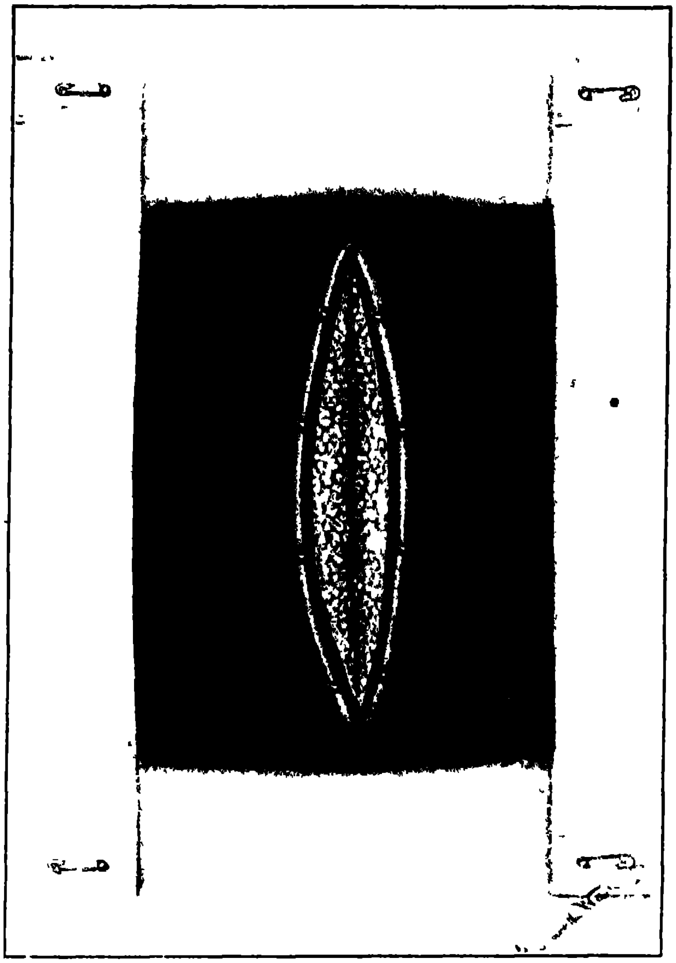

Fig. 534.—Skin incision completed, edges of rubber-dam clamped to the skin with Michel's clamps.

The Abdominal Incision.—A slit is made in the rubber-dam with scissors, corresponding in length and position with the skin incision. To slit the rubber neatly it should be thrown into a transverse fold just above the symphysis, by the operator and his assistant seizing it between the thumb and forefinger. The skin is incised and the fat is cut to the deep fascia; then the edges of the rubber-dam are fastened to the edges of the skin with Michel's clamps, clamped tight, the rubber overlapping the skin edges. Two or three clamps are needed on each side. No matter how long the operation lasts, or how much manipulation is required, including the use of retractors, the rubber-dam keeps its place at the end of the operation, and no skin surface whatever is exposed for ligatures to trail over or to infect the gloves, pads, and instruments, or coils of intestines that sometimes must be turned out of the wound and laid upon the abdomen. The skin around the wound being thus covered,

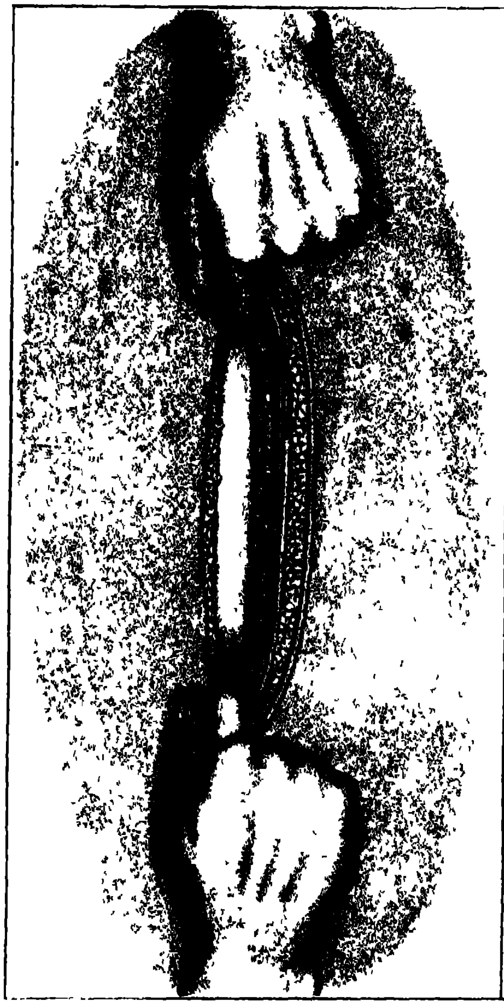

Fig. 535.—Splitting the rectus muscle.

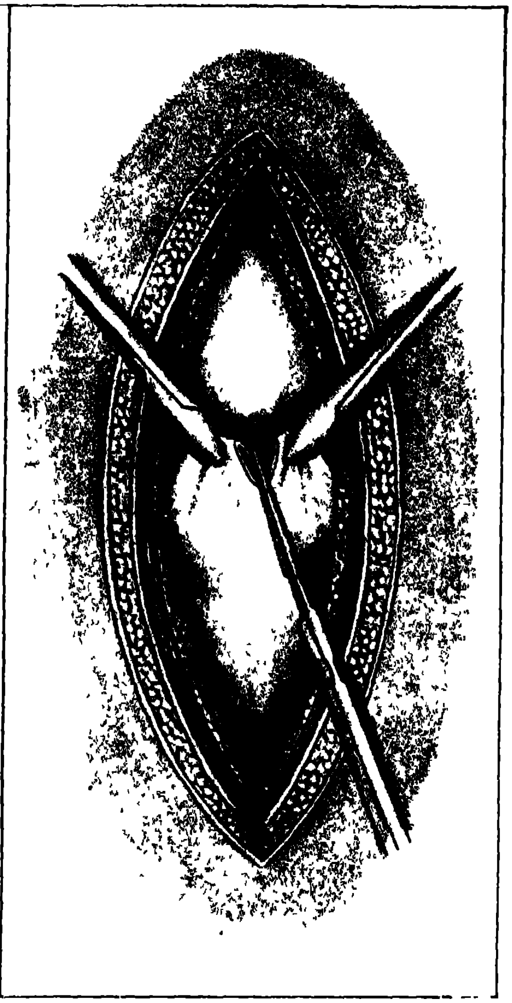

Fig. 536.—Incising the peritoneum.

the fascia is cut with a sharp knife by a light stroke. The rectus muscle which comes into view is split with the forefingers. The peritoneum is picked up by the points of two hemostats and is cut between them. A short nick only is made. As the atmospheric pressure is felt by the intestines they drop back out of the way. The incision is lengthened in the peritoneum with scissors to the full length of the wound.

Packing the Abdominal Cavity with Pads.—If there is pus or putrescible liquid in the pelvis, the patient is raised in the Trendelenburg posture and five to eight pads are packed in the abdominal cavity, above and to both sides of the pelvic brim, so as to isolate the pelvic cavity and to keep back the intestines.

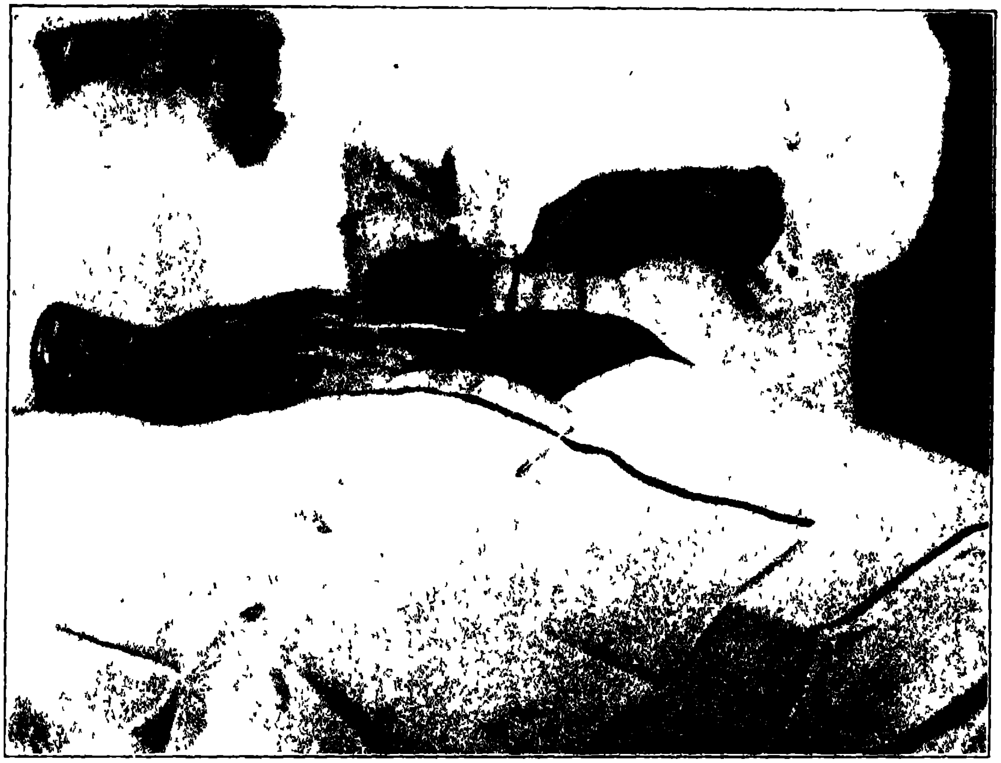

Fig 537 — Abdominal incision completed

The Trendelenburg posture is essential in many pelvic and abdominal operations, but it should be utilized only so long as it is absolutely necessary The strain on the circulatory and respiratory apparatus is much increased by keeping the trunk inclined at an angle of 45 degrees or more, and serious harm may result from the careless practice of raising a patient in the Trendelenburg posture at the beginning of an operation and keeping her there until it is finished, when many of the steps could just as well be carried out in the horizontal position.

The Methods of Securing the Blood-vessels of the Broad Ligaments and the Treatment of the Stump.—An operator should be thoroughly familiar with all the methods of treating the stump in salpingo-oöphorectomy and in the removal of pelvic and abdominal tumors. Each one has its merits and its place.

The Mass Ligature.—The broad ligament is perforated to the median side of the round ligament, with a pedicle needle armed with a double ligature, both ends equally long. A forefinger is hooked through the loop; the needle is withdrawn; the loop of the ligature is cut; one end is tied around the tube as close on the uterine cornu as possible with a surgeon's knot first and a single knot on top of it; the other is tied under the ovary around

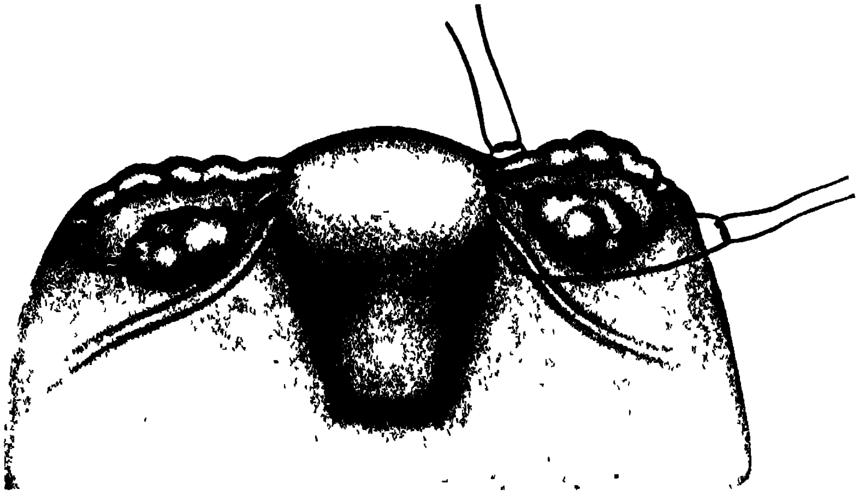

Fig. 538.—The mass ligature of the broad ligament

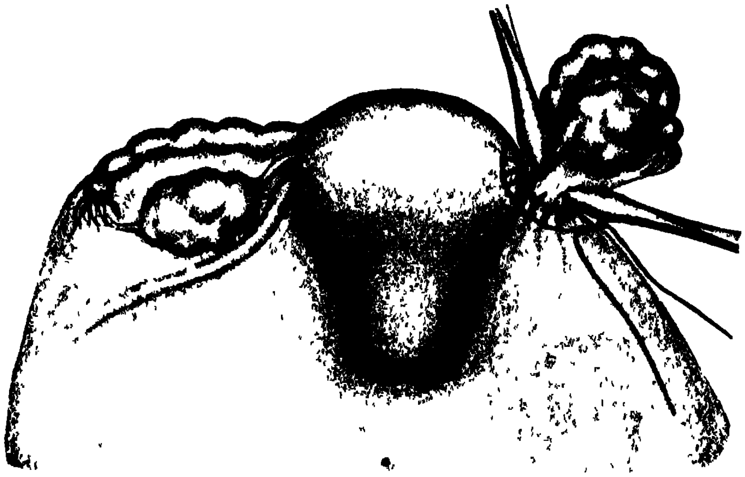

Fig. 539.—The mass ligature tied and the long ends doubled back.

the free edge of the broad ligament; the end away from the operator is left long, is doubled back around the stump, beneath the puncture point of the pedicle needle, and is tied securely around the whole stump, just under the two halves of the double ligature. The mass ligature is quickly applied, and gives the greatest security against hemorrhage, but is not suitable for a thick, infiltrated ligament nor for septic cases. The Staffordshire knot, recommended by Tait and others, is quickly tied, but does not secure the puncture point in the broad ligament.

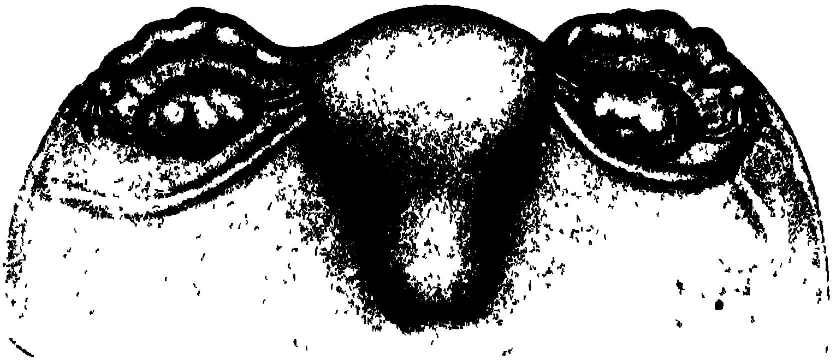

Fig. 540.—Ligatures securing the ovarian and uterine arteries.

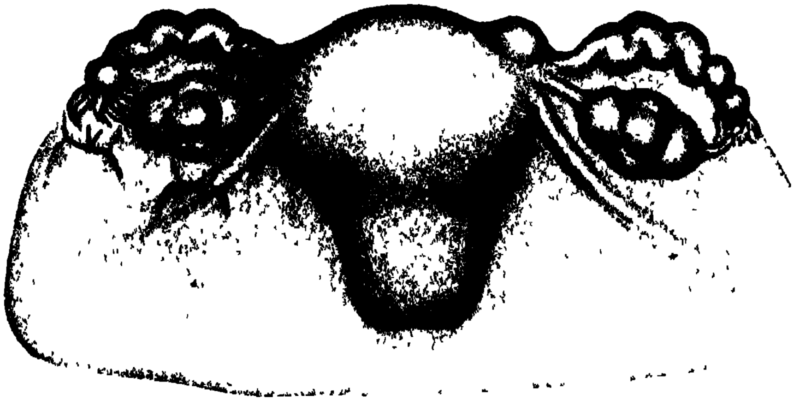

Fig. 541.—Ligatures securing the three arteries of the broad ligament

The Separate Ligation of the Arteries of the Broad Ligament—There are a number of ways to secure the arteries of the broad ligament separately. A ligature threaded on a pedicle or an ordinary curved needle may be passed under the tube and ovarian ligament and tied over the tube on the uterine cornu; another ligature is passed through the outer edge of the broad ligament far enough in the median direction to secure the ovarian artery, or around the inner side of the round ligament to secure its artery as well as the ovarian. This ligature is placed below or above the ovary as it is intended to remove or to leave it. Another plan is to place three ligatures in the broad ligament securing the uterine, the ovarian, and the round-ligament artery (Fig. 541), and then cutting off the top of the broad ligament with the tube and ovary. A wedge-shaped exsection of the uterine end of the tube may be made by this plan if desired. Another plan is to clamp the ovarian artery, to cut the broad

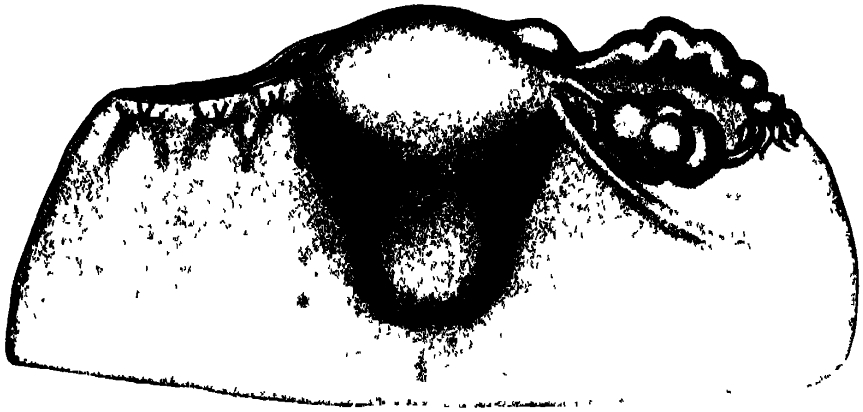

Fig 542.—Ligatures tied; tube and ovary removed with wedge-shaped exsection of uterine cornu

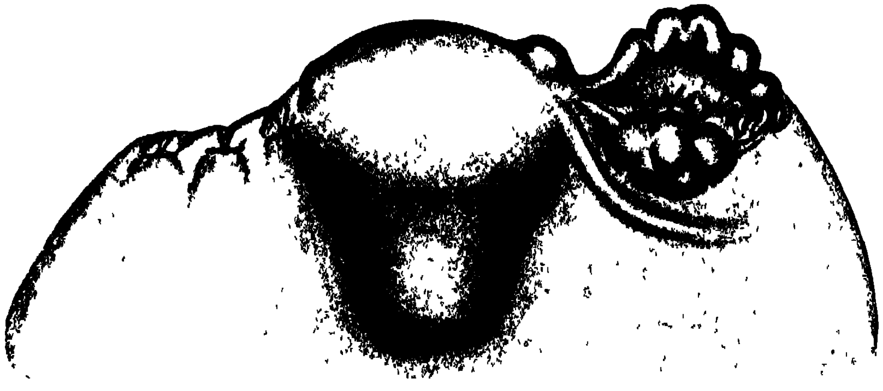

Fig 543—Tube and ovary removed on left side, ligatures applied for the removal of the tube alone on the right side.

ligament medianward, and to clamp the arteries as they are cut, tying them separately after the tube is removed, as an artery is ligated elsewhere in the body. Still another plan is to split the peritoneum over the top of the tube with a sharp knife; to cut the uterine end of the tube across at the cornu, and to strip the tube out of its bed in the mesosalpinx; the isthmus can be pulled free; it is necessary to cut the mesosalpinx of the ampulla, but the scissors can be kept so close to the under side of the tube that only the small tubal branches of the utero-ovarian artery are severed and the bleeding is not profuse. The small arteries should be tied separately with fine catgut or silk

In all the methods leaving a raw surface along the top of the broad ligament, the anterior and posterior layer of its peritoneum should be joined with a continuous suture of catgut.

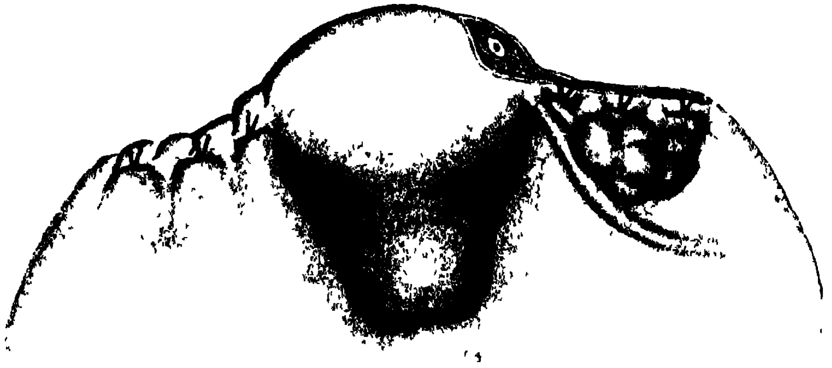

Fig 544 —Tube and ovary removed from one side, tube alone from the other

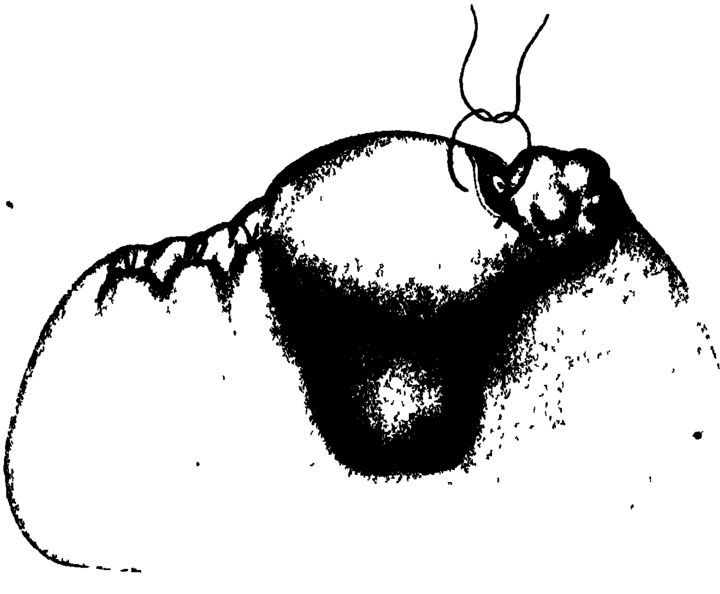

Fig 545 —Tube and ovary removed from one side; tube exsected on the other and ovary transplanted in uterine cornu

If it is desirable or necessary to remove the ovary separately, a mass ligature is placed around the mesovarium, by a pedicle needle which pierces its middle, the ovary being pulled away from the broad ligament to make as good a pedicle as possible. If the pedicle of a tumor, as an ovarian cyst, is very broad, if the broad ligament is much increased in transverse length from any cause or is very vascular, a chain ligature may be required. This ligature is most often required by a pedunculated ovarian cyst or sometimes by a broad ligament cyst (Fig. 549).

Downes' electrothermic hemostatic clamps are an indispensable part of a good equipment for abdominal and pelvic surgery.

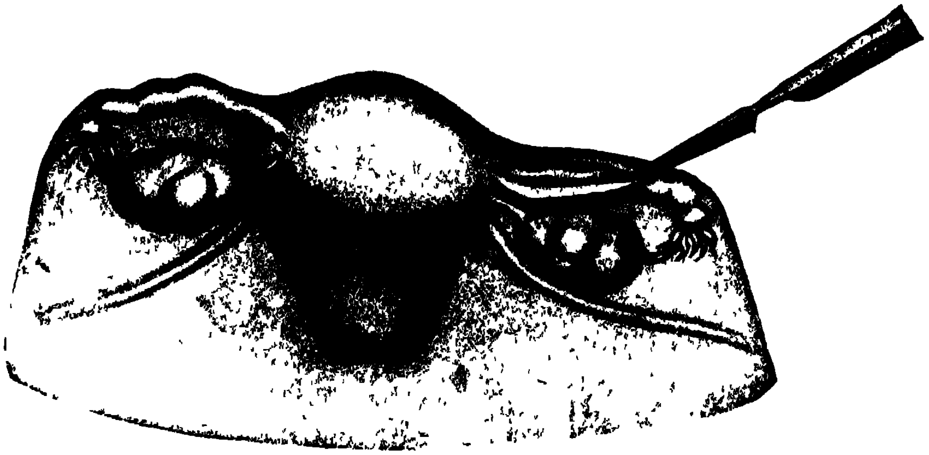

Fig. 546.—Splitting the peritoneum over the tube (diagrammatic).

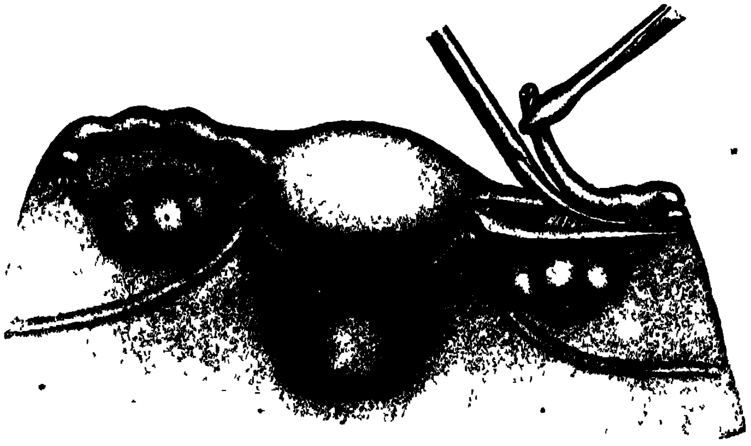

Fig. 547.—Removing the tube by dividing the mesosalpinx.

I have used them in hysterectomies for sarcoma and cancer; for tubal pregnancies; for all varieties of tubo-ovarian inflammations; for an ovarian cyst twisted on its pedicle, and other neoplasms with a slender or thin, flat pedicle; in all about fifty times. In two cases of extra-uterine pregnancy the arteries of the thickened broad ligament spurted through the stump and required ligatures. In none of the other cases was there any primary or secondary bleeding. I am not willing to try them for appendectomy on account of the risk of scorching the wall of the colon; nor would I use them for a thick, vascular pedicle.

The clamps and cable are boiled with the instruments and the transformer is placed in convenient position, connected with the current, for every abdominal operation, so that the apparatus may be used if the case is suitable for it

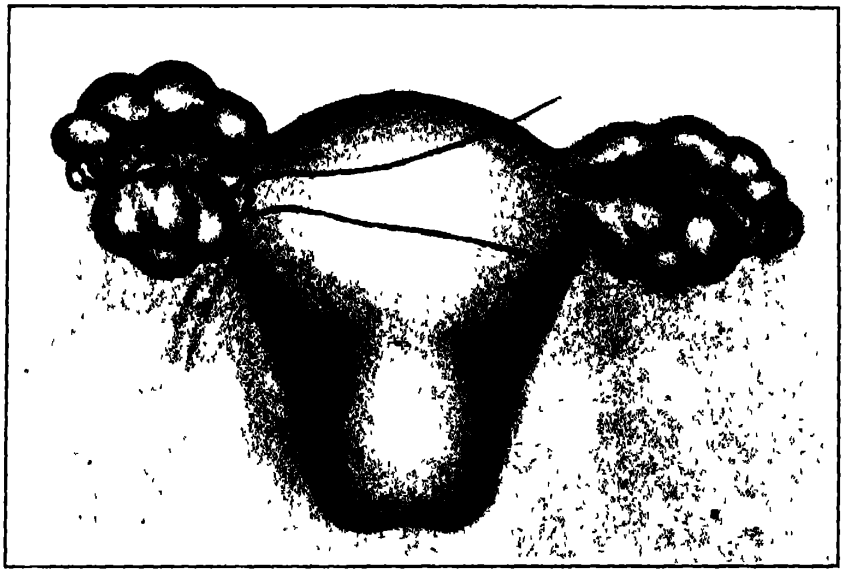

Fig. 548.—Ligation of the mesovarium.

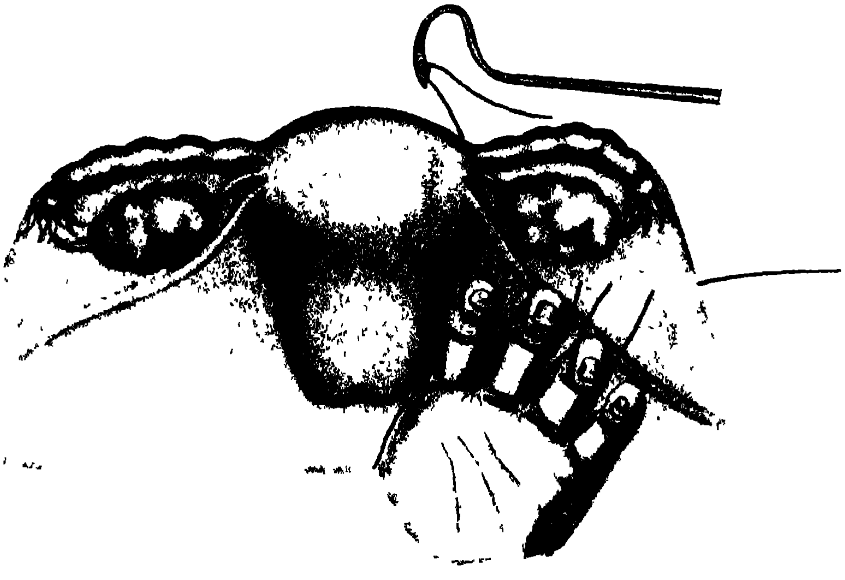

Fig 549 —Inserting a chain ligature in the broad ligament.

In applying the clamp, the inner surface of the blade is wiped with sterile oil; the clamp is fastened with the lever on the handle in such a way that none of the stump glides out of its grip at the tips of the blades. The protector is fastened under the clamp. The cable is connected; the current is turned on till the ampèremeter registers 60, it is left on thirty seconds, the tissues

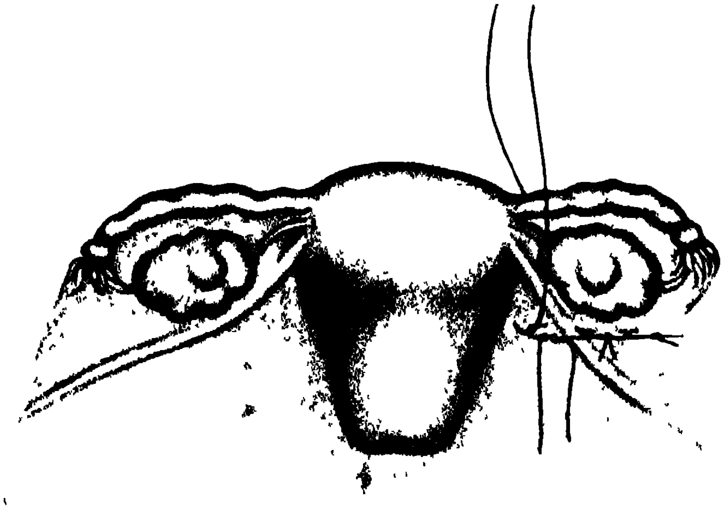

Fig 550 —The loops of the chain ligature are cut, the ends intertwined and tied.

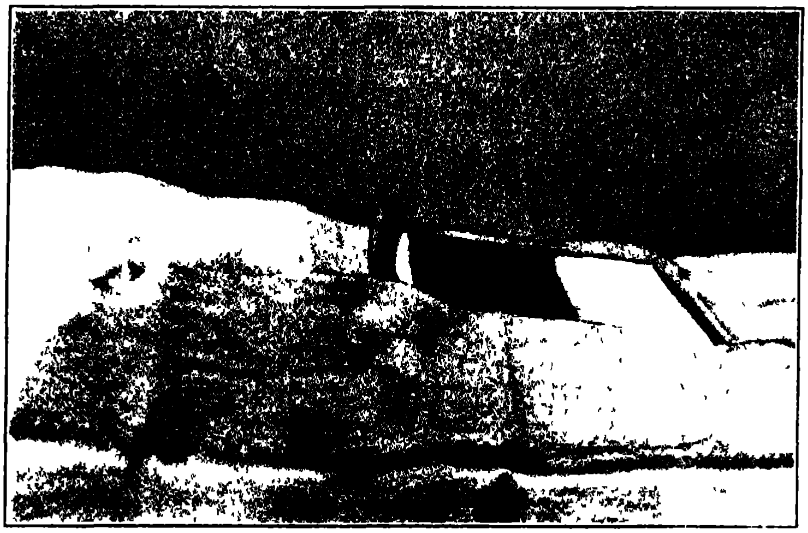

Fig 551 —The cable attached to the transformer is secured by a safety pin under an extra sterile towel

after ten to fifteen seconds bubbling with heat in its grasp. The current is turned off. The clamp remains undisturbed another thirty seconds. The tissue to be cut away is shaved off the upper surface of the clamp with a sharp knife. The clamp is loosened by throwing back the lever on its handle; it is gently withdrawn, with its blades opened as far as the protector permits; the protector is unfastened and removed; the stump, as thin as a ribbon and as white as paper, is allowed to drop and must not be dis-

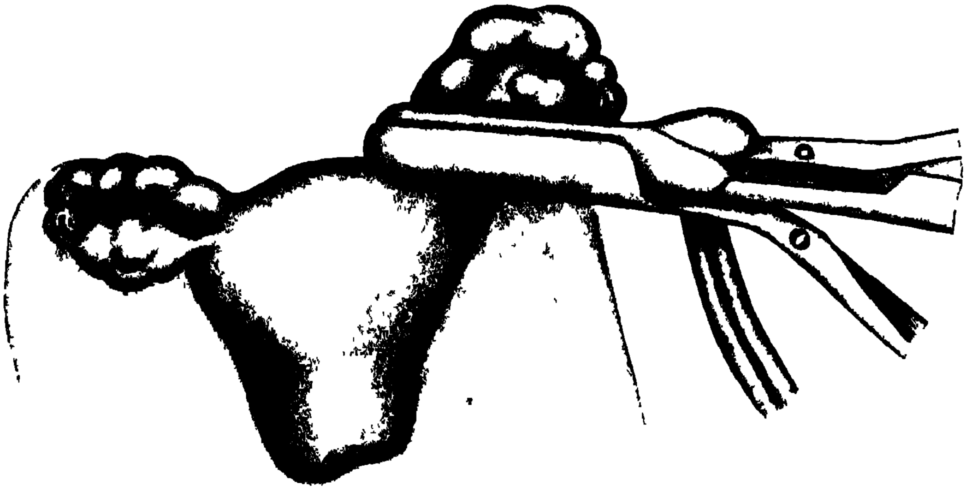

Fig 552 —The clamp is applied to the broad ligament under the tube and ovary, the protector is fastened under it

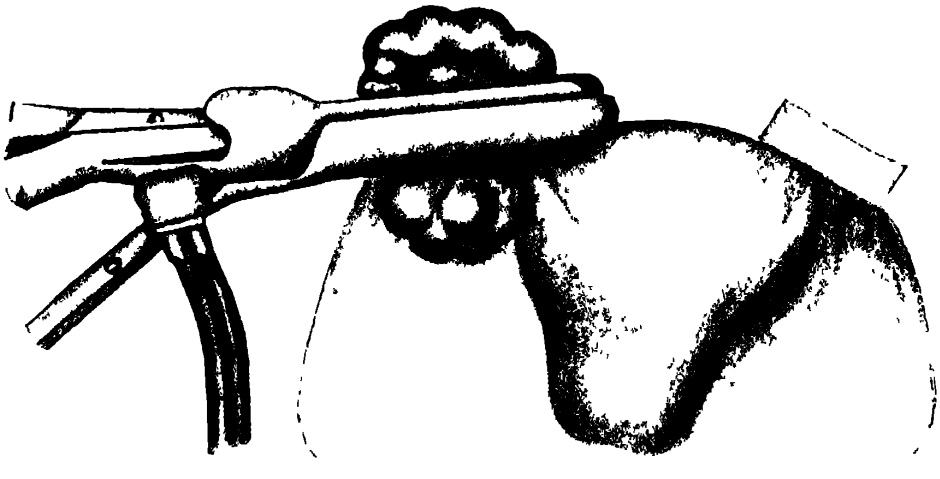

Fig 553 —The clamp is applied under the tube and above the ovary for the removal of the former alone

turbed with pads, instruments, handling, or traction. It must be carefully observed, however, for bleeding. If it does not bleed in the course of two or three minutes, secondary hemorrhage need not be feared. This statement is based on the experience of Downes, myself, and a number of others. I know of no case of secondary hemorrhage so far and feel perfectly secure in its use in favorable cases.

The angiotribe, which is intended to afford hemostasis by crushing the blood-vessels in the broad ligament with great force, is simply mentioned to be unreservedly condemned. The number of deaths from secondary hemorrhage after its use make its employment unjustifiable

The Choice of Catgut or Silk for Suture and Ligature Material.—The author's experience extends over the time when nothing but silk was used for ligature material, over the period of reaction against silk and the exclusive use of catgut, to the present common-sense practice of using silk as a ligature material in all perfectly clean cases, without drainage and with no chance of oozing, the formation of a hematocele, and the necessity for a puncture of the vaginal vault. Catgut at best is sometimes treacherous: the knot may slip, the gut break or absorb too soon, with a fatal secondary hemorrhage as the result This risk is remote and must be taken in all infections, inflammatory conditions, and if there is some oozing which is not completely controlled Cumol catgut is used exclusively for ligature material on account of its tensile strength and rapid absorption. The suture material is formalin gut, prepared as described (p. 595), with a durability of two to four weeks

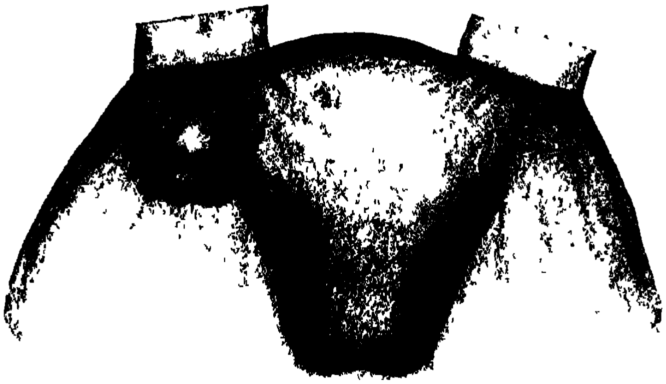

Fig 554.—The stumps left after the removal of the appendages by Downes' clamps.

The Examination of the Appendix.—After the abdominal or pelvic operation is finished,[1] the vermiform appendix should always be examined, by retracting the right side of the wound with an abdominal retractor and lifting the caput coli out of the wound. The latter is easily recognized by its white color and the longitudinal fibrous bands in it. In 10 per cent. or more of all abdominal sections the gynecic surgeon finds an indication for the removal of the appendix, in adhesions, distention, injection,

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[1] In a suspension of the uterus the appendix must be examined before the suspension stitches are tied.

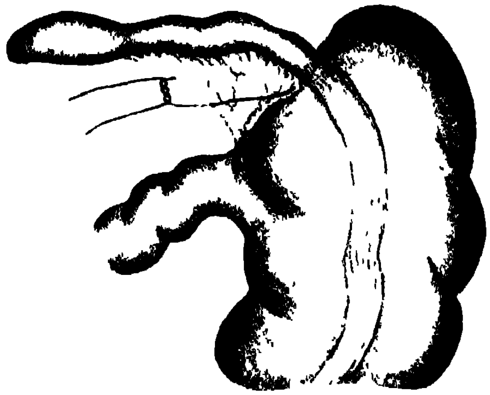

Fig 555 —Ligating the mesappendix.

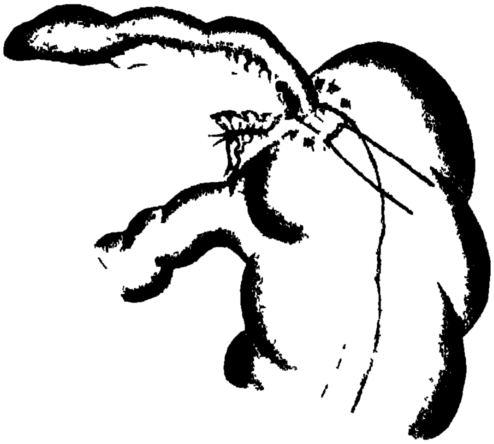

Fig. 556.—Cutting the mesappendix and inserting the purse-string suture around the base of the appendix.

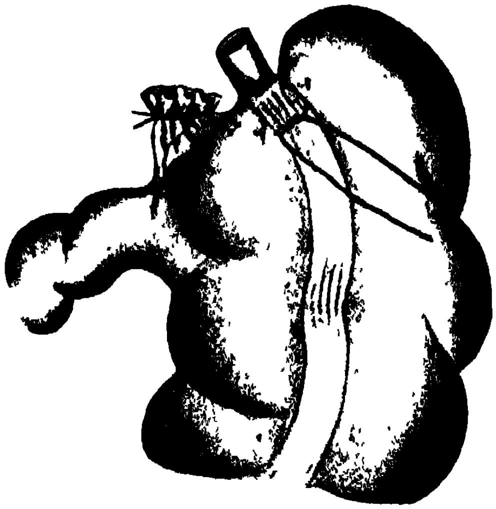

Fig 557 —The appendix is amputated.

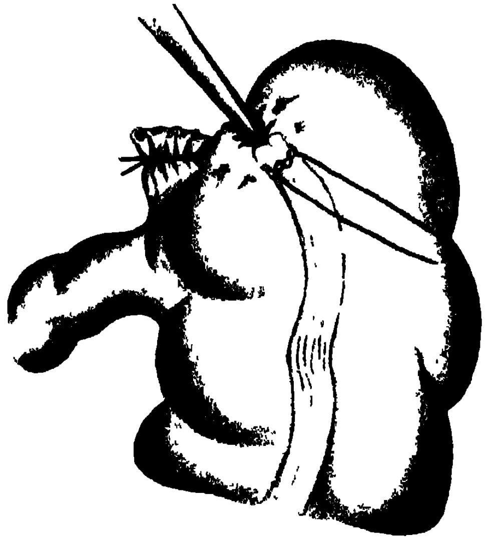

Fig. 558 —The stump of the appendix is inverted.

or infiltration. The mesappendix is ligated and cut; a purse-string suture of catgut is inserted around the base of the appendix; it is cut off; its stump, at least a quarter of an inch long, is inverted with tissue forceps, the scissors and tissue forceps used to cut and invert the appendix are dropped on the floor; the purse-string suture is pulled tight and tied. A mattress suture unites the peritoneum over the site of the stump.

The Toilet of the Peritoneum.—At the conclusion of the operation there should be a careful inspection of the whole field for

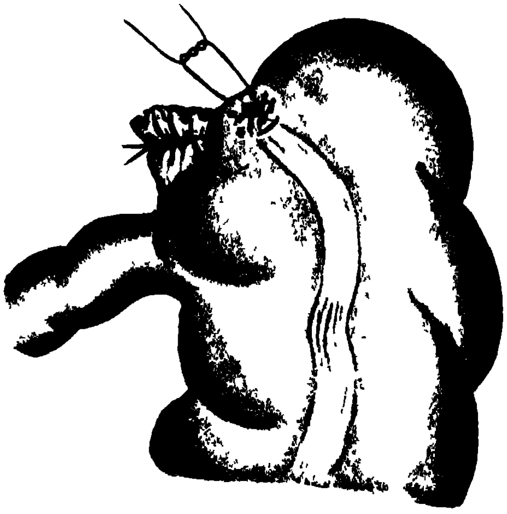

Fig. 559.—A mattress suture covers the site of the inverted stump of the appendix

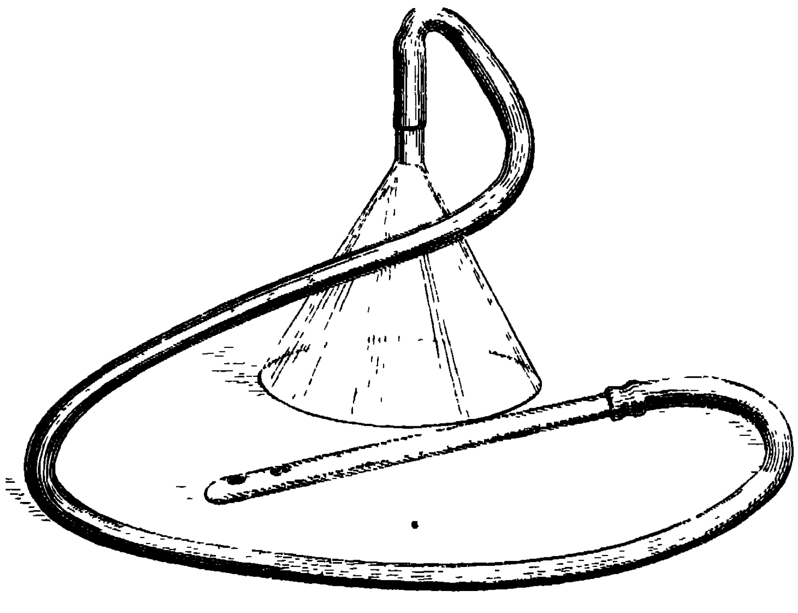

Fig. 560.—Apparatus for douching the abdominal cavity

oozing or hemorrhage; raw surfaces should be covered by joining peritoneal edges over them, if possible. All blood and discharges should be carefully cleaned out with dry pads, especially from Douglas's pouch, the vesico-uterine pouch, and the kidney pouches.

The practice of douching the abdomen and of pouring normal salt solution into it to remain is not so efficient as the dry cleansing, is an unnecessary waste of time, wets the patient, predisposes her to cold, and is not in accord with good surgical principles in general. The only condition in which douching the abdominal cavity is of service is for the hemorrhage of a ruptured tubal gestation or a tubal abortion. It is the quickest way to remove clots and liquid blood from all the nooks and crannies of the whole abdominal cavity. Gallons of hot sterile water are required (110° F.) Normal salt solution is unnecessary. The water is poured in a glass funnel held at arm's length above the abdomen. A metal irrigating tube is attached to the rubber tubing of the funnel.

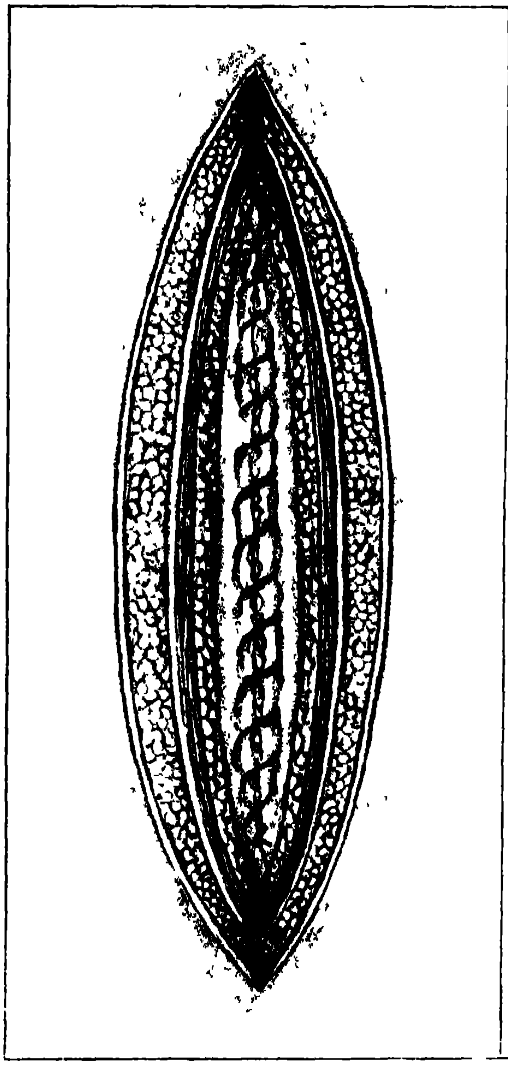

Fig 561.—The peritoneum united by a continuous suture

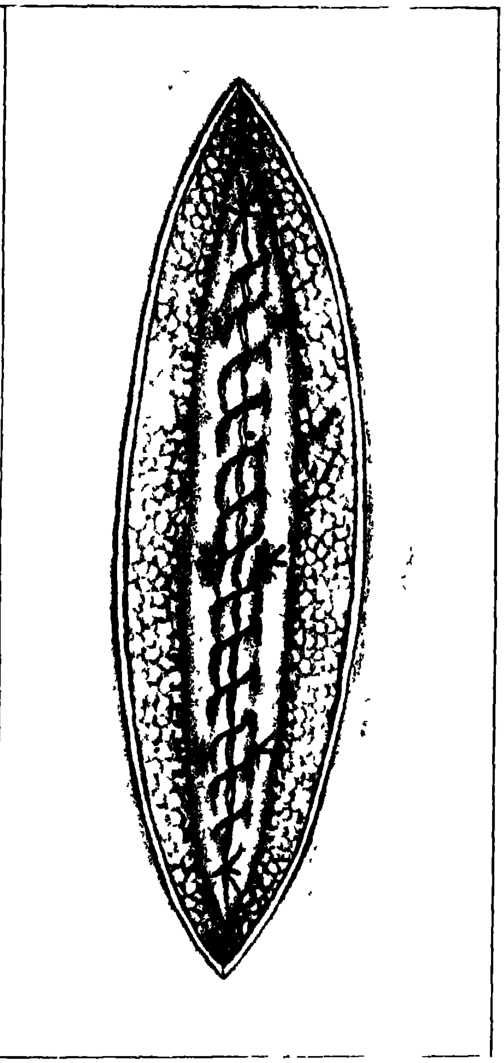

Fig 562.—The fascia united by a continuous suture and further secured by three mattress sutures

The Closure of the Abdominal Wound.—The peritoneum is united with a running suture of formalin gut (No. 1), two or three mattress sutures (formalin gut, No. 3) are inserted in the fascia, the fascia is united with a continuous suture (formalin gut, No. 3), the mattress sutures are tied; the rubber-dam is removed; the fat and superficial fascia are united with a tier suture (formalin gut, No. 00 to No. 1), in two tiers, with the single knot in the upper angle of the wound The skin is united with an intracutaneous, subcuticular stitch, or, if the wound is long and economy of time is essential, with a running suture The suture is formalin gut, No 1, threaded on a long, straight, spear pointed needle not requiring a needle-holder. The skin above each needle puncture is held together with the forceps that are provided in the Michel clamp outfit. For the intracutaneous stitch the author finds Emmet's cervical needle the most convenient.

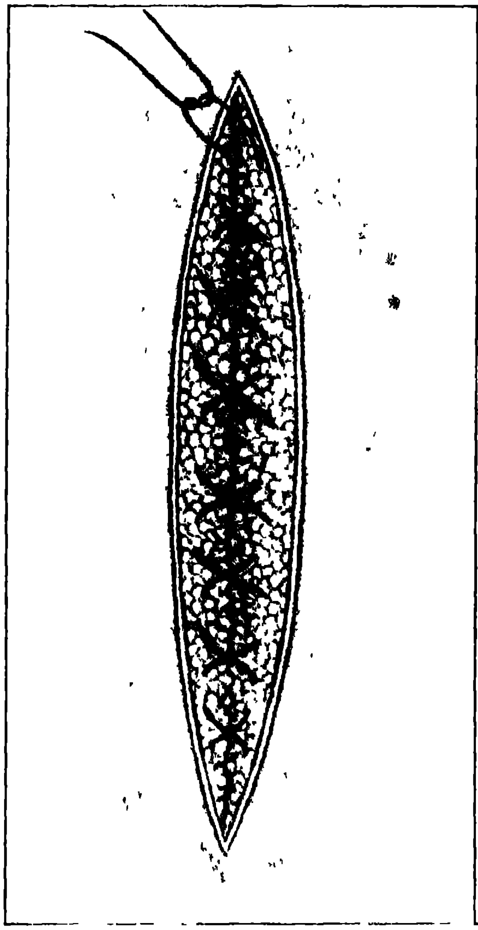

Fig. 563 —The fat and superficial fascia united by a double tier continuous suture

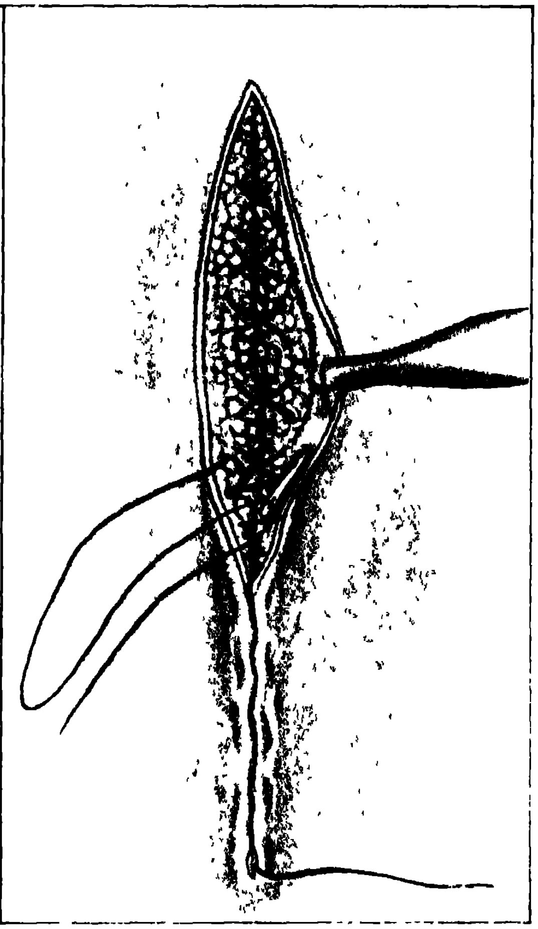

Fig 564.—The insertion of the subcuticular stitch in the skin

Dressing the Wound.—The skin of the abdomen is carefully cleansed with sublimate solution, 1 : 2000, poured over it out of a pitcher and dried with a sterile towel A sheet of silver foil is laid over the wound; a sheet of the paper from the book of foil is laid over the foil; alcohol is poured on it to make it adhere to the skin. Squares of gauze are placed over the lower abdomen, and the dressing is held in place by strips of zinc oxid plaster A many-tailed soft flannel binder is laid on the wheeled stretcher; the woman is lifted from the operating table, laid on the stretcher so that the binder is under the loins As she is lifted from the table to the stretcher a nurse cleanses her back. The binder is folded over the abdomen and is then pinned tight,

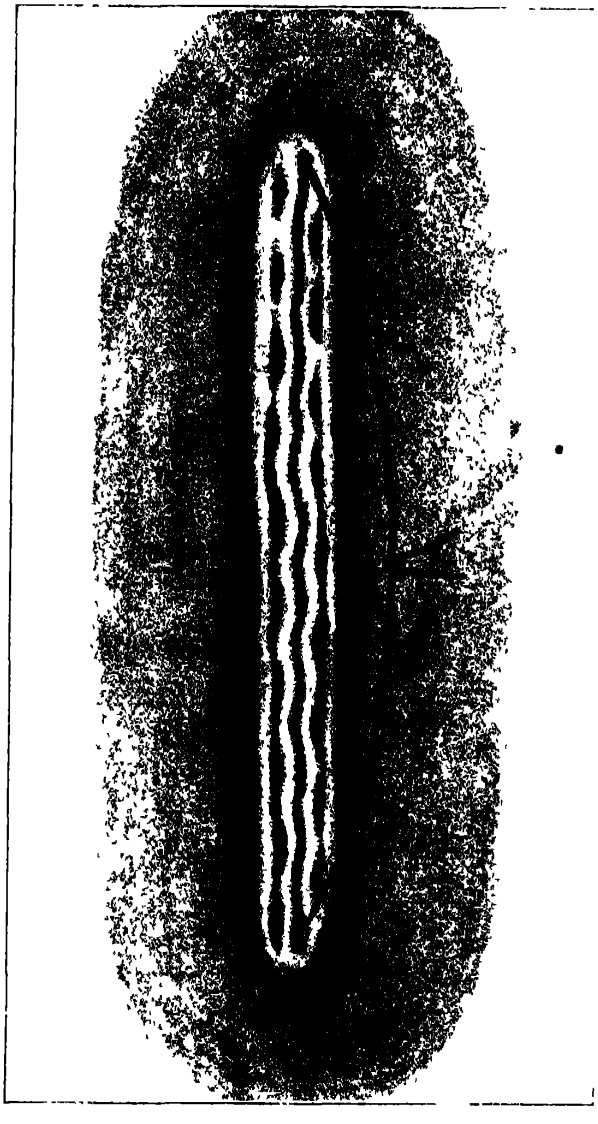

Fig. 565.—The subcuticular stitch inserted and its ends knotted.

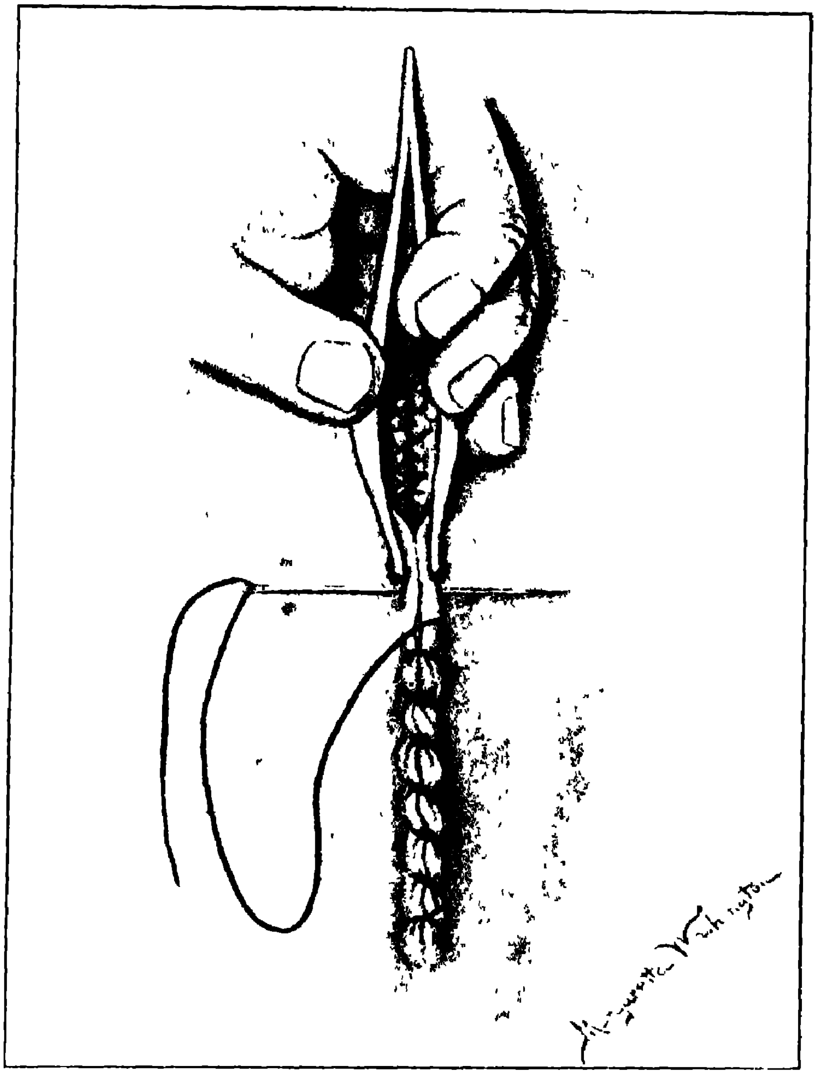

Fig. 566.—Inserting a continuous suture in the skin.

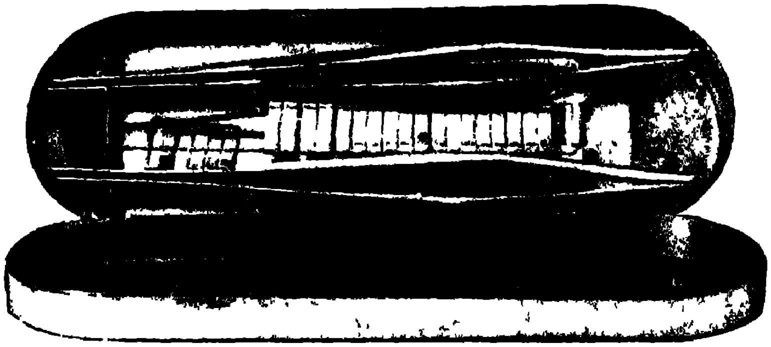

Fig. 567.—Michel's clamps and forceps.

from above downward, with three rows of safety pins, one in the middle and one on each side.

Drainage.—The vexed question of drainage is practically settled. It is avoided if possible, but occasionally the patient's life depends upon it In all active suppurative processes, except those of gonorrhea and those that are strictly localized, as an ovarian abscess; in infectious infiltration of the pelvic connective tissue, especially in streptococcic infection, in the case of a diseased ulcerative condition of the bowel-wall; if there is persistent oozing which can not be checked, and if the ureters are injured, drainage is required. The constant demands upon the author for the operative treatment of grave puerperal infections have made the question of the best form of drainage a very anxious one. After more or less disappointing trials of various forms of drainage, the following plan has been uniformly followed for the last seven or eight years: A glass tube is placed in Douglas's pouch resting against the back wall of the uterus; a piece of sterile cotton plugs the mouth of the tube until the tube is covered with gauze; the whole pelvis is filled with a gauze strip, 6 inches wide, the end of which emerges from the wound just above the drainage-tube.[1] The wound is as carefully closed, layer by

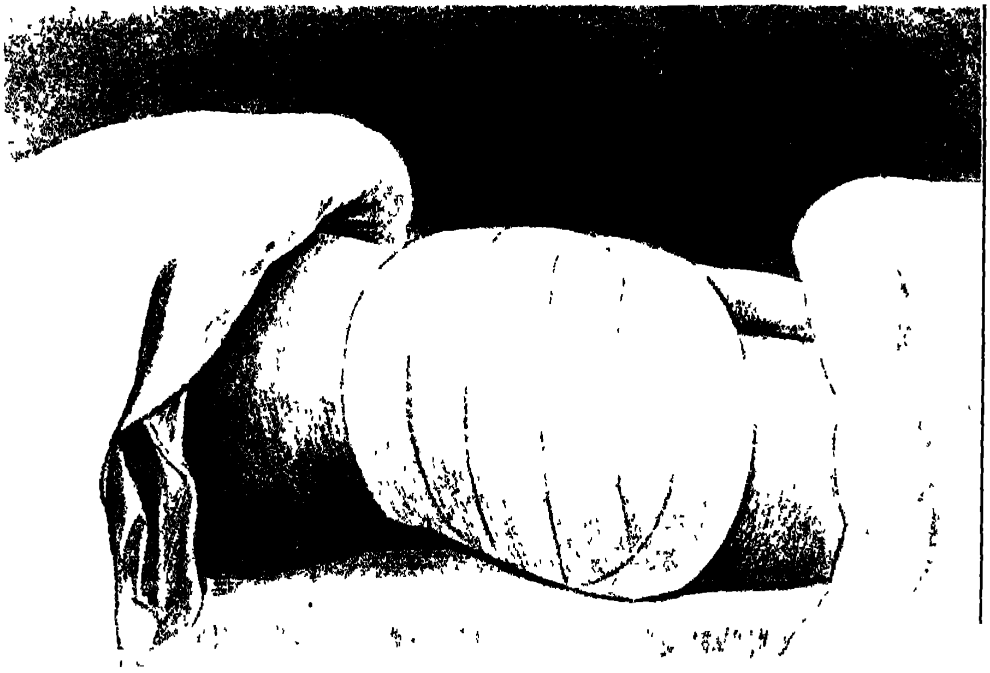

Fig 568 —Zinc oxid plaster adhesive strips applied

layer, as though drainage had not been employed; the skin just above and below the drainage-tube and gauze strip is fastened together with one Michel's clamp.[1] One or two silkworm-gut sutures are inserted through the skin, fascia, and rectus muscle, but not through the peritoneum, to take the strain off the catgut sutures. The wound above and below the tube is covered with silver foil. The tube is sucked out by rubber tubing slipped within it, attached to a two-ounce hard-rubber piston syringe.

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[1] At first I used a glass tube alone; then gauze alone, neither was satisfactory. The intestines come in too close relationship with the tube, adhere around it and

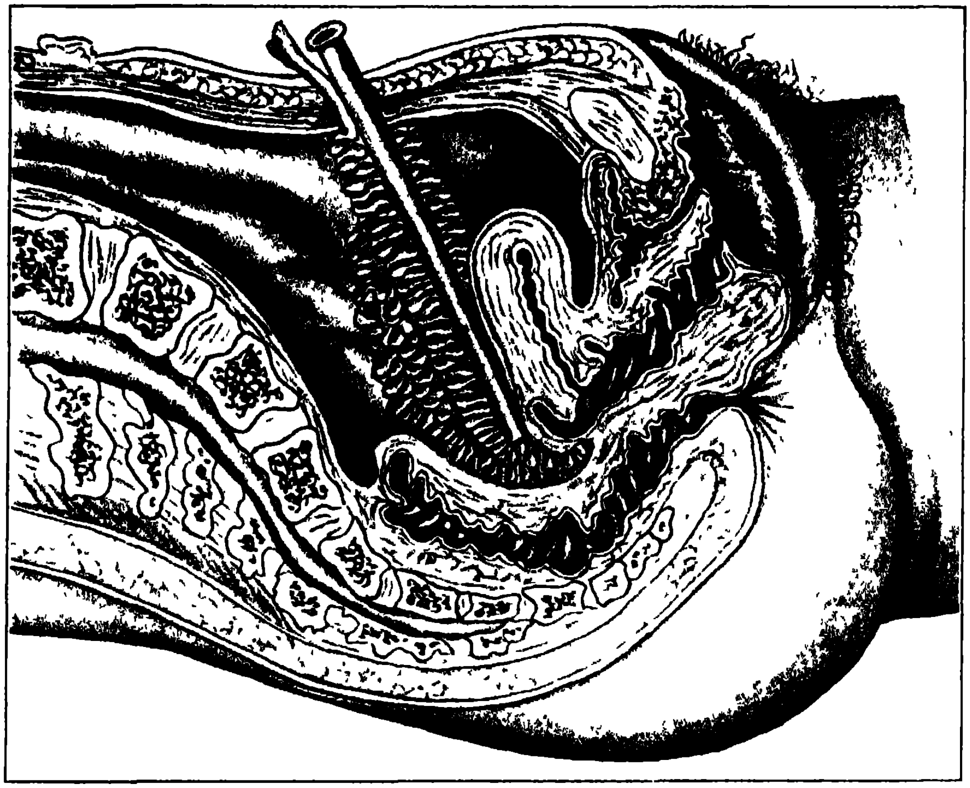

Fig. 569.—Drainage by tube and gauze.

The gauze squares are slit so as to surround the tube projecting above the surface of the abdomen. When the flange of the

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may be injured by it, but of the two, the tube is better than the gauze. If a strip of gauze is packed in the pelvis and pulled out at the end of twenty four or forty-eight hours, the discharges with which it is soaked drip back into Douglas's pouch, making a puddle of putrescible or infected fluid. I once saw a patient die in consequence. By using the tube and gauze together the disadvantages of each are avoided and it is possible to save a virulently streptococcic infected pelvis by this kind of drainage that would be hopeless without it. Even if the gauze is simply used to pack the pelvis and to check oozing, the tube should be added for the reason stated, that blood will drip back in the pelvis when the gauze is removed.

[1] These clamps are designed for the rapid closure of skin wounds. They are not so quick nor so satisfactory as the continuous suture, but they have their uses. The self-feeding forceps made in Germany by Leiter is very ingenious, but it often fails to work.

tube must be elevated a little to accommodate the last squares of folded gauze, other squares are placed over its orifice. The strips of zinc oxid plaster and the binder close the wound, which is not opened for twenty-four hours. Then, with all the precautions required for the original operation, the dressings are removed; the glass tube is again sucked out by a rubber tubing slipped down to the bottom of Douglas's pouch and attached to a two-ounce hard-rubber piston syringe. The wound is then closed as before, except that yellow surgical adhesive plaster,

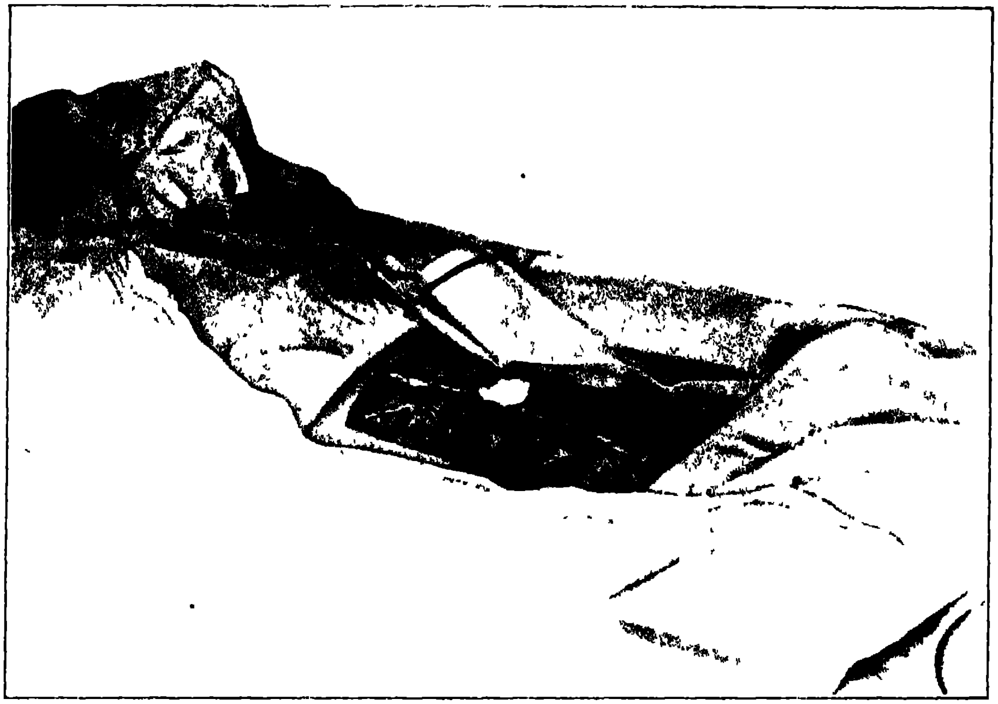

Fig. 570.—The mouth of the drainage-tube is stoppered with cotton till it is covered with sterile gauze.

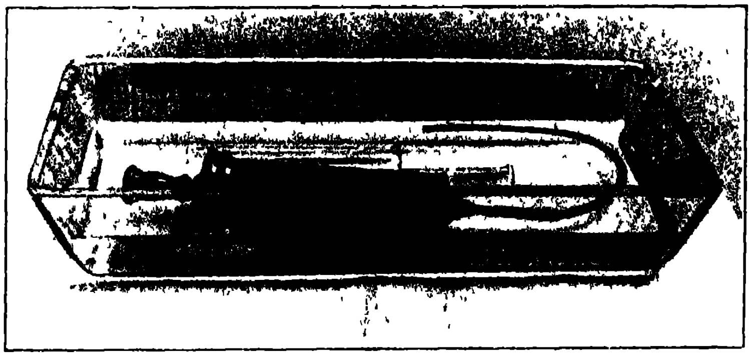

Fig. 571.—Drainage-tubes and syringe for sucking them out.

heated, is substituted for the zinc oxid plaster. At the end of another twenty-four hours the wound is again exposed; the glass tube sucked out as before; the gauze strip is pulled out with the fingers and tissue forceps, while an assistant holds his finger over the top of the glass tube to prevent its coming out, the glass tube is again sucked out; a rubber drainage-tube is slipped inside the glass tube; the glass tube is pulled out while a delicate long-bladed drainage forceps holds the rubber tube and prevents the glass tube pulling it out; a safety pin is fastened to the rubber tube; the wound is dressed again. The next day the dressings are removed; the bed is tilted up on one side; a Kelly pad is slipped under the patient's waist, a straight-tipped medicine dropper is attached to the tube of a fountain syringe, is inserted in the rubber drainage-tube, and a quart or more of sterile water is allowed to flow through the pelvis and out alongside the drainage-tube The irrigation is repeated daily for about ten days. After a week the tube is shortened every day by cutting a piece off the top until it is removed. *It must not be taken out*, for it is usually impossible to get it back again. The original silver foil protects the wound and is not removed unless it is displaced or torn, when it is replaced. It is often surprising to see what nice-looking wounds can be secured in spite of drainage. The Michel clamps are removed by the little hooklets that come

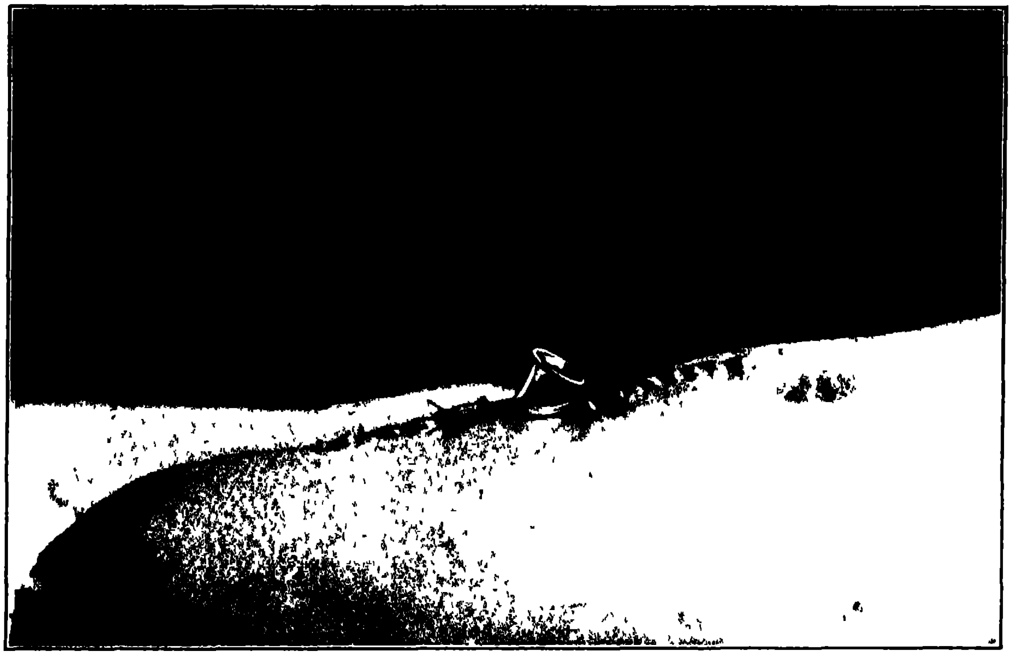

Fig 572.—Drainage-tube and gauze in the pelvis; wound closed, with Michel's clamps next the tube and below and above a continuous suture

with them, at the end of a week, and at the same time the silkworm-gut sutures are removed.

If the area to be drained after an abdominal section is confined to Douglas's pouch below the uterosacral ligaments, drainage through the vaginal vault is occasionally preferable to the abdominal drainage. An assistant passes the first two fingers of one hand into the vagina and places their tips firmly against the posterior vaginal vault, separating them a trifle The operator plunges the points of a long-handled, sharp-pointed scissors, curved on the flat, through the bottom of Douglas's pouch, into the vaginal vault, between the assistant's finger-tips, and withdraws them open, to enlarge the opening. The end of a six-inch-wide gauze bandage is seized in a long, heavy Péan forceps and is passed into the vagina, where it is seized by the assistant and pulled out of the vulva, after the forceps release their grip on it The rest of the gauze strip, or enough of it to fill Douglas's pouch to and beyond the uterosacral ligaments, is packed in the pelvis. The assistant changes his gloves. The end of the

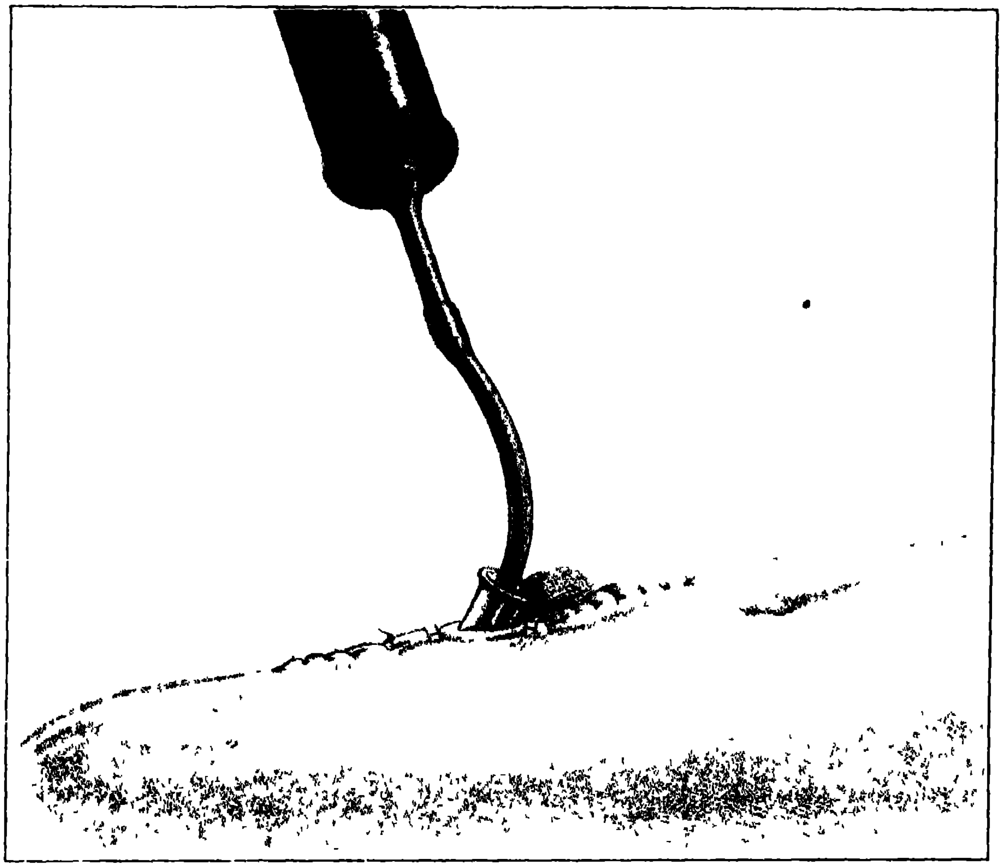

Fig 573 —Sucking out the drainage tube

gauze strip protruding from the vulva is cut off when the operation is concluded, and a fresh strip of gauze is packed in the vagina. The vaginal and pelvic packings are removed at the

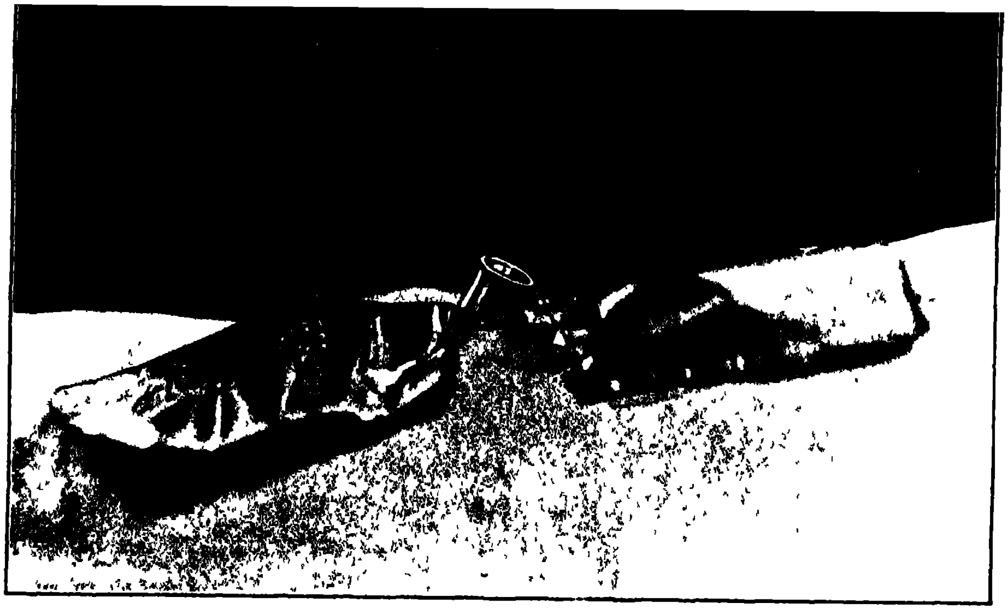

Fig. 574.—Silver foil above and below the drainage-tube

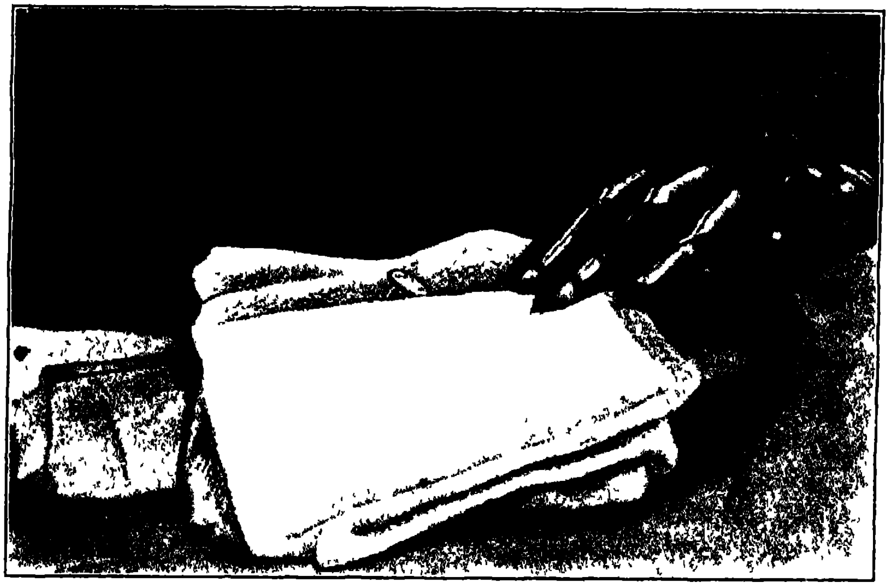

Fig. 575.—Gauze squares, slit part way through the middle, surrounding the tube.

end of forty-eight hours; the latter is replaced by a T-shaped rubber tube inserted into Douglas's pouch. A fresh strip of gauze is packed in the vagina. On and after the conclusion of the third day sterile water is injected daily into the drainage-tube and consequently into Douglas's pouch; it returns alongside the tube into the vagina.

Following the adage of to-day,—"When in doubt do not drain,"—there is occasionally an accumulation of serum or blood in Douglas's pouch after an abdominal section which may become infected. The symptoms on vaginal examination are distinctive. Behind the uterus there is a sensitive mass, evidently localized, with an indistinct cystic or doughy feel. The temperature is elevated, the pulse is accelerated, the patient complains of pelvic pain and discomfort, the bowels are irritable or there is obstinate constipation, and the abdomen is somewhat distended. The condition is quickly and effectually relieved by puncturing the vaginal vault with long-handled, sharp-pointed

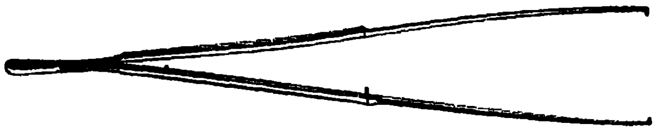

Fig 576.—Drainage tube forceps.

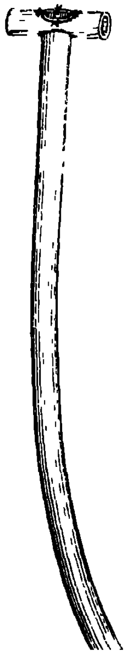

Fig 577.—T-shaped rubber drain.

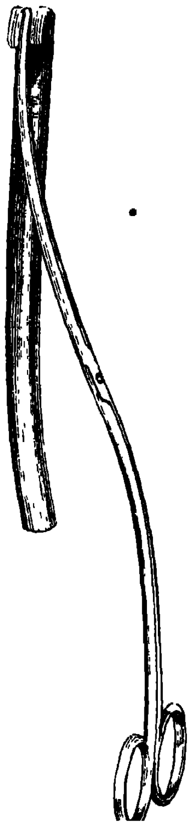

Fig. 578.—T rubber drain seized in grip of dressing forceps.

scissors curved on the flat, washing out the pelvic cavity with sterile water through a Fritsch-Bozeman two-way catheter, and inserting a T-drain through which Douglas's pouch is irrigated daily. The tube is removed when the discharge ceases, the water comes back clear, and the local and systemic symptoms disappear—in about ten days

The Technic of a Vaginal Section.—The vagina is distended with retractors, an anterior, short-bladed, a posterior, and two lateral retractors with narrow blades. Most room is gained by an anterior colpotomy, which also renders the uterus and its appendages more accessible. It is, accordingly, the operation usually selected. The peritoneal cavity may be opened through the anterior vaginal wall in one of three ways: by a transverse incision in the anterior vaginal vault encircling the cervix (Duhrssen), by a median longitudinal incision in the anterior vaginal wall from the vaginal portion of the cervix an inch and a half downward (Orthmann), and by a T-shaped incision, the transverse bar encircling the cervix and extending for about three-fourths of an inch to both sides of the median line, the longitudinal incision being about an inch and a half long (Mackenrodt, Webster) The last is much the best of the three The patient is arranged on the table in the dorsal position as for any vaginal operation The cervix is dissected free from the bladder and the upper portion of the vaginal wall is likewise separated from the bladder, which is pushed upward and forward, the vesico-uterine reduplication of peritoneum is opened, the appendages are hooked down and delivered through the wound, and the uterus is made accessible by exaggeratedly anteverting it Landau's ecarteurs (p. 247) are a great convenience at this stage of the operation The uterus and its appendages may be made more accessible by uniting a posterior colpotomy (a transverse incision through the posterior vaginal vault into Douglas's pouch, an inch or more long) with the anterior colpotomy, ligating both uterine arteries and cutting the bases of the broad ligament free from the uterus on the median side of the ligatures

Posterior colpotomy alone is usually reserved for an exploration of the pelvic organs; for the evacuation of an abscess in Douglas's pouch or on the posterior aspect of the broad ligament; for the removal of an infected gestation sac posterior to the uterus, for the excision of a myoma in the lower posterior uterine wall; and for drainage of the pelvic cavity. The wounds in both vaults and the anterior vaginal wall are closed with interrupted close-set sutures of silkworm-gut, shotted, which are removed in two weeks If necessary, drainage may be provided by a strip of gauze between two sutures, which is removed in forty-eight hours. If necessary to continue the irrigation and drainage of the pelvis for some days (as in a suppurating cavity, or large, raw, oozing surface), the gauze strip is replaced by a T-shaped rubber drainage-tube, which is inserted in the grip

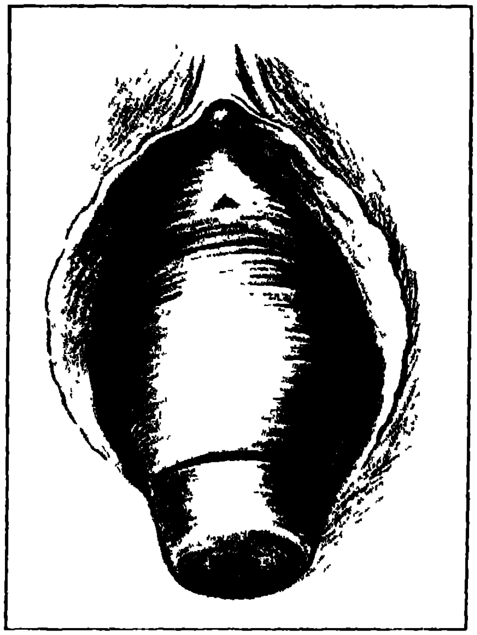

Fig 579 —Vaginal section by transverse incision

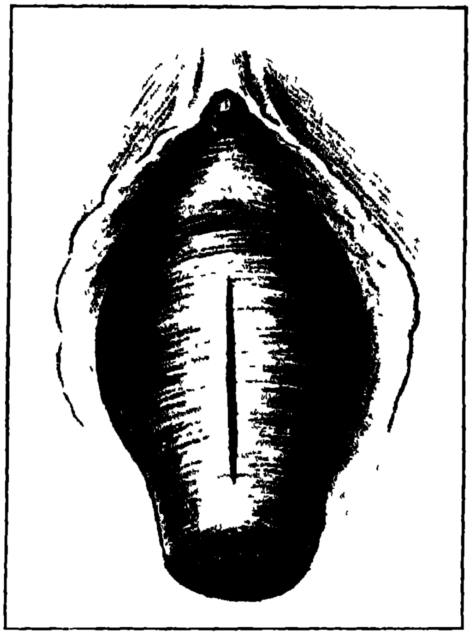

Fig 580.—Vaginal section by longitudinal incision

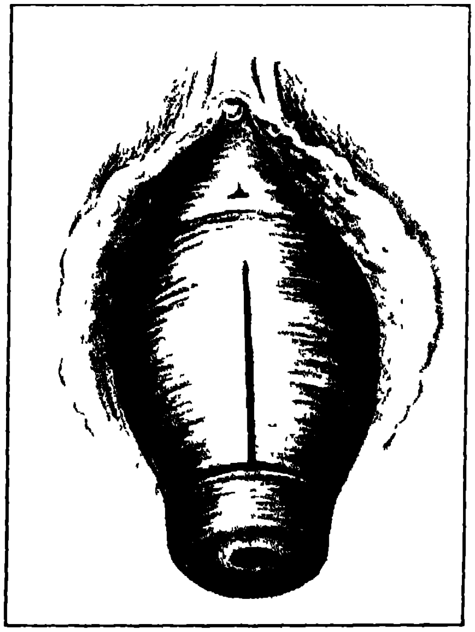

Fig 581 —Vaginal section by combined transverse and longitudinal incisions

of a dressing forceps, and usually remains ten days. By attaching a straight-tip medicine dropper to the tube of a fountain syringe and inserting its tip in the drainage-tube the pelvic cavity or closed space to be drained may be irrigated daily with sterile water or weak permanganate of potassium solution, the water flowing out alongside the tube. If the bases of the broad ligaments are cut free from the uterus, care should be exercised to include the portions on the median side of the ligature around the uterine artery in at least one stitch on each side of the vaginal vaults; otherwise the cervix and vaginal vaults may be robbed of their strongest support (the cardinal ligaments of the cervix) and a prolapse may result.

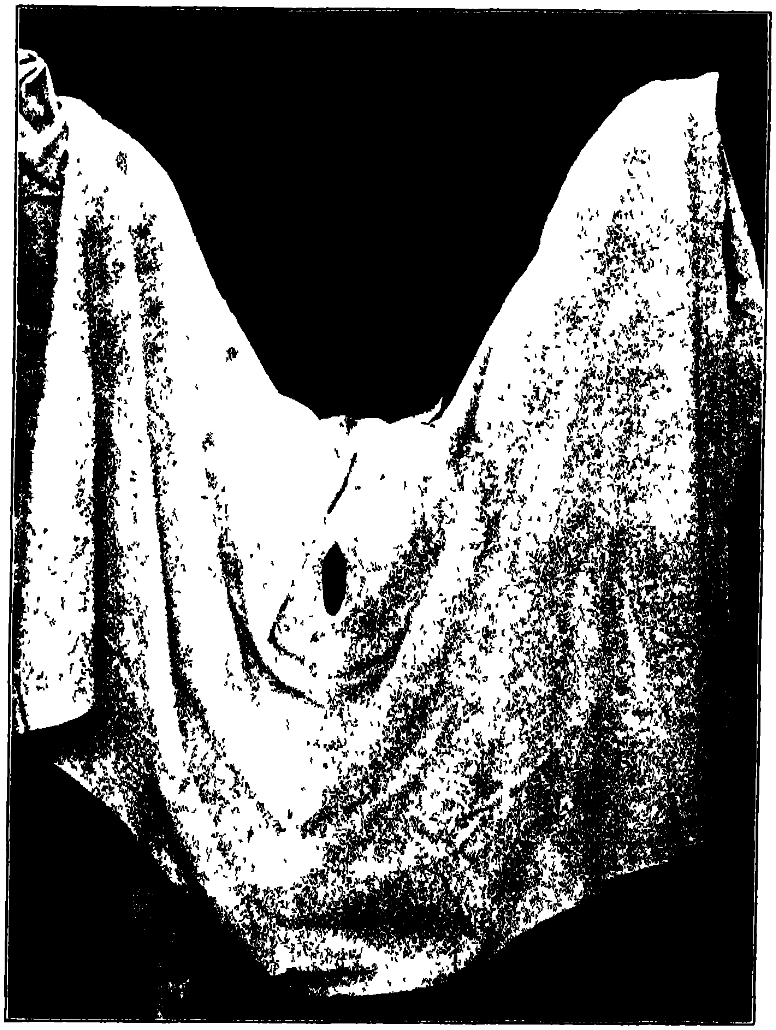

Fig. 582.—Field of operation in a vaginal operation exposed by a fenestrated sheet, which protects the rest of the interfemoral space.

The Technic of a Plastic Operation.—The patient, if possible, should be prepared for forty-eight hours beforehand by a purgative on two successive nights, rest in bed, two examinations of the urine, and a modified diet. The pudendal hair should be clipped with a clipper and shaved with a safety razor. The vagina is irrigated with sublimate solution, 1 : 4000, followed by sterile water; it is then packed with sterile gauze. Before the operation there should be repeated irrigations of the lower bowel until it is completely empty. Six to twelve injections of a pint to a quart of salt solution should be used, 40 grains to the pint. The limbs are protected by canton flannel leggings. The legs are supported by upright leg-holders and stirrups. Two assistants, one at each side of the table, and a nurse to thread needles and to hand instruments, are required. Instead of the

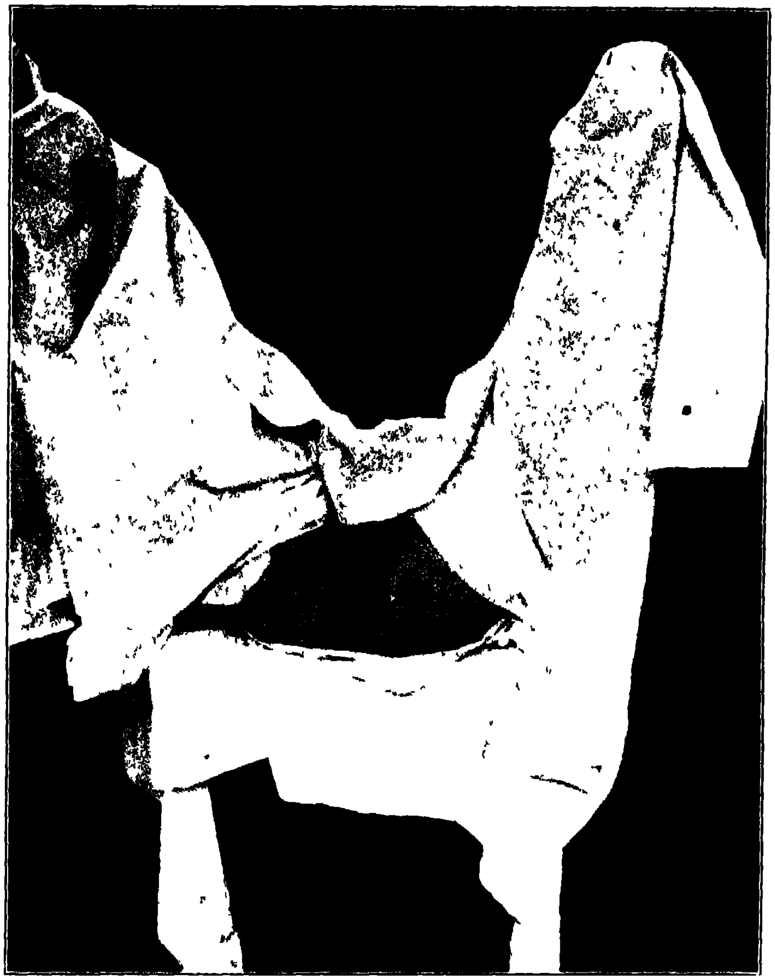

Fig 583 —Sheets and towels draped around the patient, giving more room than is afforded by the arrangement in figure 582. Necessary for such an operation as resection of the pudic nerves

gauze pads used in abdominal surgery, sea sponges[1] are used, soaked over night in a 1 : 1000 sublimate solution, and rinsed out before use in sterile water. They are used only once. The operator, assistants, and nurse wear rubber gloves. The field of operation is protected by wrapping a sterile sheet around each of the patient's legs, laying a sterile towel over the pubis and tucking another one under the buttocks and over the Kelly pad on which they rest. Another plan is to drape over the limbs and genitalia a sheet with an oval opening, 6 inches long and 2 inches wide, hemmed with tape, exposing the vulva, but protecting the anus. If an abdominal section is to follow the plastic operation, tapes fastened to the abdominal binder must be tied around the thighs, to hold the abdominal dressings in place (Fig. 584). The instrument table is on the left; another table is on the right, with three bowls containing respectively tincture of green soap, sterile water, and sublimate solution (1 : 2000). Back of the operator is the douche stand with two douche jars, one for

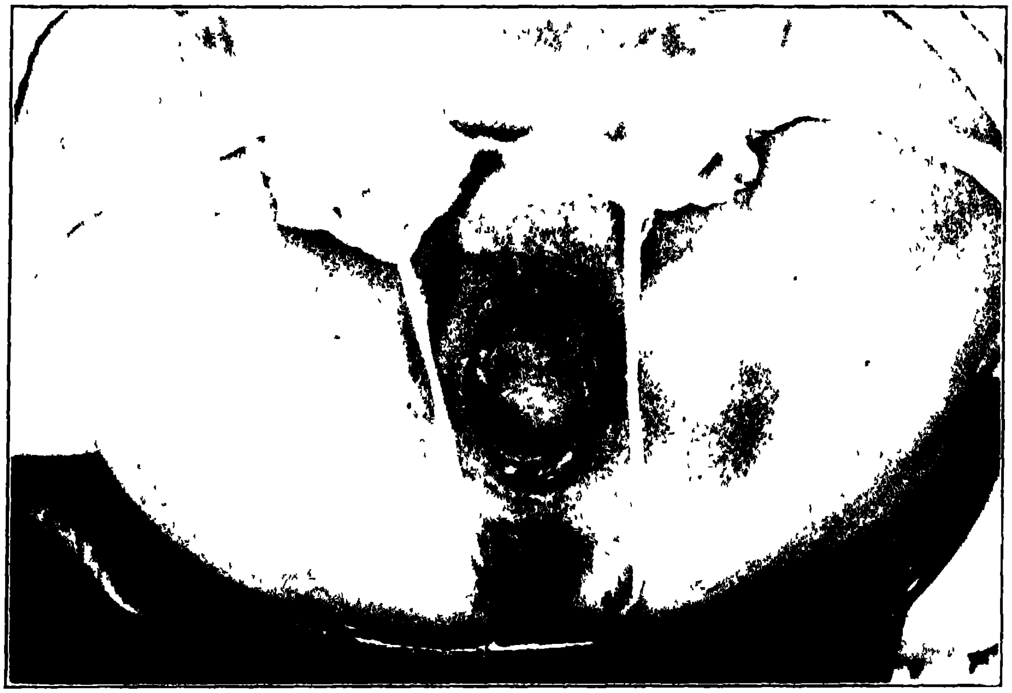

Fig. 584.—Abdominal dressings held in place by tapes in a patient in whom an abdominal section followed a plastic operation for cystocele.

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[1] The preliminary preparation of sea sponges is as follows: They are beaten, dry, to get the sand and dirt out of them, they are washed in running water for twenty-four hours; submerged in a solution of hydrochloric acid, f℥ ij–Oj of water, for twelve hours; washed in sterile water; dipped in a saturated solution of permanganate of potassium; immediately transferred to a saturated solution of oxalic acid; washed again in sterile water and preserved in a 1 : 40 carbolic acid solution.

sterile water, one for sublimate solution (1 : 2000). On the operator's right hand is a basin on a stand, filled with sterile water, to rinse off curets, to deposit instruments, etc. The operator or his assistant cleanses the vulva and then the vagina with pledgets of sterile cotton, tincture of green soap, and water; finally the vulva and vagina are scrubbed with pledgets of cotton soaked in the sublimate solution. This is quicker and more effectual than the douche. The author, many years ago, used the continual stream of water over denuded surfaces in plastic surgery, but soon gave it up as unnecessary, and indeed disadvantageous. A good assistant with sea sponges keeps the field of operation cleaner and drier than is possible with the continuous irrigation.

Dilatation of the cervix and curettage of the uterine cavity are a part of so many gynecological operations that the description of their technic has been postponed to the section on operative technic in general. They are required for the coexistent endometritis as a part of the operative treatment of displacements of the uterus, of all the plastic operations, and of many of the operations for pelvic infections and inflammations, as well as for dysmenorrhea and sterility.

Technic.—The anterior lip of the cervix is seized with a double tenaculum (Fig. 503). The small-sized Goodell or Baer dilator is inserted and separated to about three-fourths of an inch. The Wathen's heavy dilator is next used up to an inch, five or ten minutes being consumed in the dilatation Next the four-branched Cleveland dilator is used and screwed up to 70 or 90 on the scale. The author has used this instrument for the past two years and secures better results with it than with any other instrument; but a considerable dilatation must first be effected before it can be inserted. A four-branched dilator is much better in principle than one with two branches, which to be effectual must be used in two different directions, but only stretches the cervix in one way at a time, and subjects it to more danger of injury with less dilatation than does the four-branched instrument. After the last dilator has remained in place for about five minutes at its full expansion the blades are again approximated and the instrument is withdrawn. The four walls of the uterine cavity—anterior, posterior, lateral, and its roof—are then scraped with the sharp edge of a Sims' curet, each at least a half dozen times, the handle being held between the thumb and forefinger and the blade pressed firmly enough against the endometrium to cut into and remove it, but not so forcibly as to penetrate the firmer myometrium. When the endometrium is scraped off, a grating sensation is communicated to the curet. The Sims' curet is removed and the endometrium brought with it is dropped in a vessel containing a 10 per cent. formalin solution, or absolute alcohol, to prepare it for microscopical examination. The Sims' curet does not fit in the uterine cornua well, and may leave fragments of hypertrophied or diseased endometrium there. It should always be followed, therefore, by a Martin's curet, with especial attention to the endometrium of the fundus and the cornua. Finally, an Emmet's curet forceps should always be inserted to the fundus, opened and closed in all directions to detect and to remove a polyp which a curet will repeatedly slip over. The operation is concluded by an intra-uterine douche of sterile water, through a Fritsch-Bozeman catheter.

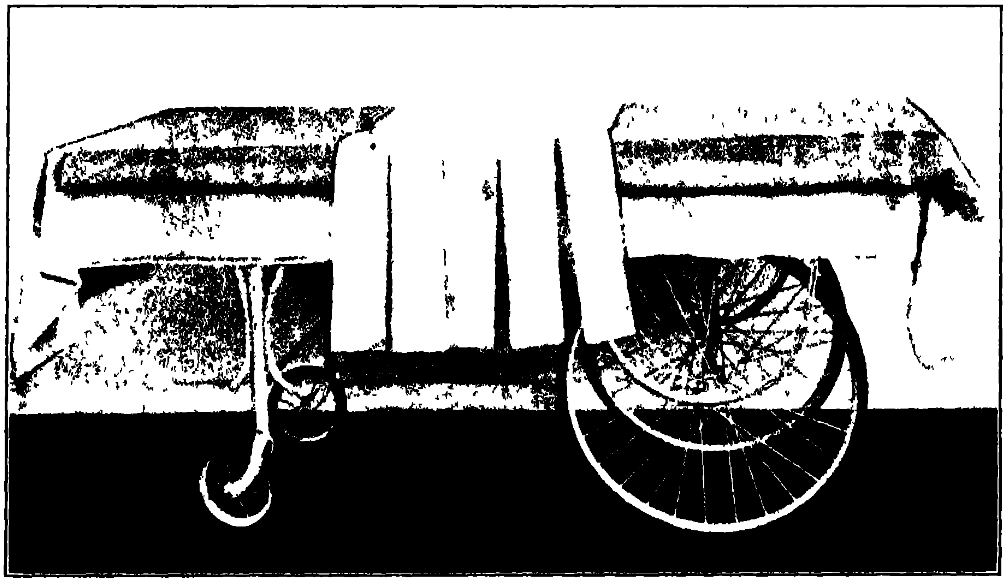

Fig. 585 —Many-tailed binder on wheeled stretcher, on which patient is laid after her removal from the operating table.

Gauze packing after a curettage is only necessary or desirable if there is free bleeding, which very rarely occurs. The uterus is packed full of gauze in a strip two inches wide, sterilized in a large test-tube; it is removed in twelve hours. The practice of leaving a tube of any kind in the cervix and uterus to maintain dilatation for some days is not commendable. In a considerable proportion of cases the foreign body reduces the resisting power of the raw surface in the uterine cavity, or becomes foul by the decomposition of blood upon it, and there is infection of the endometrium and of the Fallopian tubes.

The After-treatment of an Abdominal Section.—The Transportation of the Patient from the Operating Table to Bed.—On a wheeled stretcher brought alongside the operating table there is placed an air cushion the whole length of the stretcher; a blanket and the abdominal binder. The ankles and wrists are released from the straps and bandages that held them. The patient is lifted from the operating table, with her trunk and limbs horizontal. Letting the body sag in the middle or having it jolted or jarred in any way is carefully avoided. As the patient is held horizontally for a moment, a nurse cleanses her back of blood that may have soiled it. She is then placed slowly and gently upon the stretcher so that her body rests upon the binder from the buttocks to the floating ribs. The tails of the binder are brought forward and fastened with safety pins. In cold weather, a cotton jacket, on the model of a Murphy breast binder, is applied, before the patient leaves the operating room, which has a much higher temperature than the halls through which she passes. The blanket on which she lies is folded over her. Another one is tucked around her so that only the face is exposed, and she is transported to her bed with as little delay as possible.

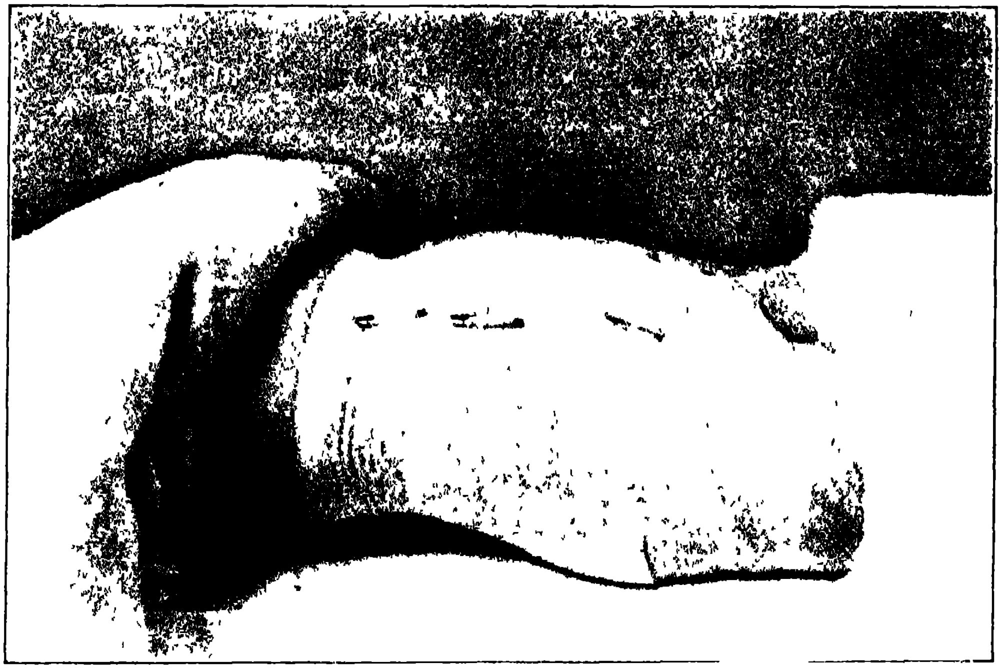

Fig. 586 —Many-tailed binder applied

The Preparation of the Bed and External Heat.—The bed is prepared so that the woman lies between blankets. Under that on which her body rests, six hot-water bags are placed, three on each side. The caps must be screwed tight, so that there shall be no leakage; the temperature of the water should not be over

150° and the nurse must exercise the greatest care to see that the patient's skin surface is protected by a thick layer of blanket and nowhere comes in contact with the bags; otherwise serious burns will occur. A towel is pinned under the patient's head to protect the bed if she vomits. The body is covered with a blanket and the ordinary bed-clothes. The artificial heat is removed when the temperature has reached 99° F. The skin surface of the limbs and chest is wiped off with warm alcohol and water, and dried, under the blanket.

Guarding a Recent Abdominal Section.—The nurse in charge of an abdominal section is not permitted to leave the patient for an instant for the first twenty-four hours. Relief is afforded the nurse when necessary, but one nurse does not leave the bedside until another takes her place. In three instances in the author's early practice patients left their beds shortly after an abdominal section. In one, within three hours after the removal of an eleven-pound myoma from the broad ligament, the woman got out of bed, walked across the room, seized a large wash-basin full of cracked ice, and drained the quart or more of ice-water that it contained to the last drop. She suffered no other inconvenience than a prolonged and excessive vomiting. In another, a patient in the Philadelphia Hospital, twenty-four hours after a double salpingo-oophorectomy, became maniacal, sprang from her bed,

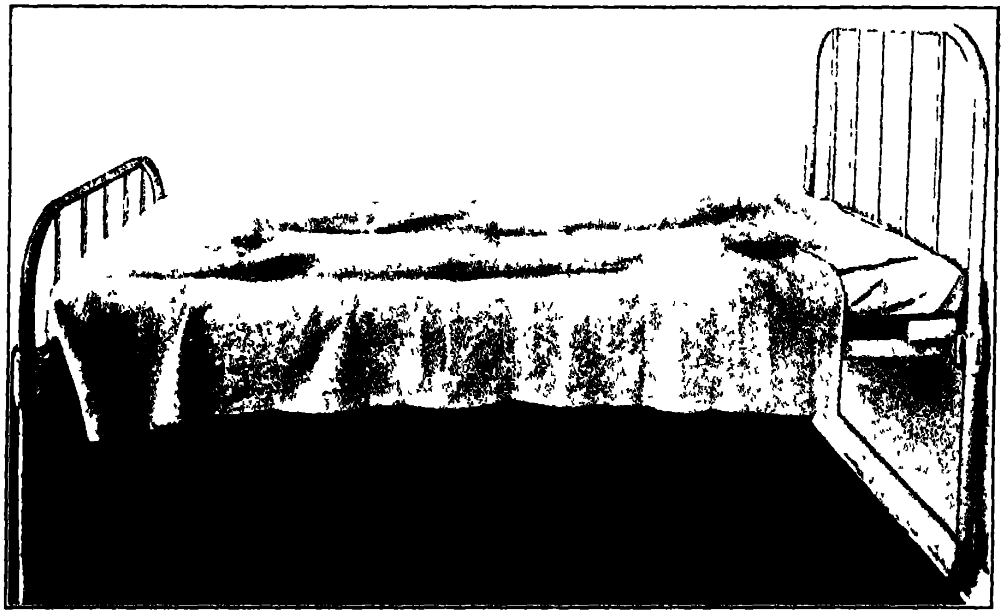

Fig. 587.—Bed arranged for reception of patient. A trough is made under the blanket by hot-water bags on either side A towel is pinned to the lower blanket under the patient's head.

seized the bed-clothes, waved them over her head, and fled along one of the corridors, shrieking at the top of her voice. She was chased for several minutes by the terrified nurses before she was captured and returned to bed. She developed no untoward symptom whatever. The third patient had a nightmare the second night after a myomectomy. She got out of bed and walked some distance before she was discovered. Her wound had been sewed with catgut. It burst open from top to bottom, and her small intestines, as we discovered the following day, lay upon the abdomen under the dressings. They were returned, the wound resewed with interrupted silkworm-gut sutures, and there was not even a rise of temperature to indicate that any complication had occurred Although these cases happened to turn out well, the experience is not one that an operator cares to have repeatedly.

Diet.—For twenty-four hours the patient receives nothing by the mouth. She is then given one dram of milk and one dram of lime-water every hour for three hours. If her stomach is retentive, the milk is increased by a dram every hour till she is taking an ounce, the lime-water being kept at a dram Bicarbonate of soda, 5 grains, or milk of magnesia, ♏xv, may be substituted for the lime-water if the stomach is irritable. Two drams of cool water are given midway between the milk feedings. No cracked ice is allowed If there is a tendency to tympany or the patient objects to milk, two drams of barley-water, alternating with two drams of clear animal broth, are given every hour for three hours, then in increased amounts by a dram an hour, till an ounce is reached. At the end of twenty-four hours the feeding interval is increased to two hours, the quantity to two ounces, and the water midway between the feedings to half an ounce. After the third day, a soft diet, gradually increased in variety and amount, is allowed.

If the stomach is unretentive, mouth-feeding is not persisted in. Rectal injections, every four hours, of predigested beef (one ounce) and normal salt solution (four ounces) are substituted. In addition, an enema of eight ounces of salt solution is required twice a day to supply fluid to the circulatory apparatus. One submammary injection a day, of a pint, is often preferable to the enema.

Bowels.—At the end of twenty-four hours, an enema of turpentine (f℥ss), magnes. sulph. (℥ss), glycerin (f℥j), and water (f℥ij) is given, to relieve tympany, which it usually does effectually At the end of forty-eight hours one-eighth grain of calomel is given every hour for eight doses. Two hours after the last dose, two ounces of citrate of magnesia are given every two hours, midway between the feedings, for three doses, followed by another compound enema of glycerin, Epsom salts, turpentine, and water. During the rest of the convalescence cascara sagrada (gtt. x–xx, fluid extract) at night and effervescent phosphate of soda (ʒij) in a tumbler of hot water in the morning are usually the best laxatives. If there is excessive tympany or the bowels are very difficult to move, a half grain of calomel is given every hour for six doses, followed two hours later by a quarter grain of elaterium, and two hours later by the compound enema. An alternative plan of treatment is $\frac{1}{100}$ grain of eserin, hypodermatically, followed by turpentine ♏v, in emulsion every two hours by the mouth, for six doses, and by an enema of four ounces hot milk of asafetida. The insertion of the rectal tube from time to time permits the escape of flatus and gives great comfort to the patient.

Auscultation determines the existence of intestinal peristalsis. Its absence, with enormous tympany and grave systemic symptoms, denotes peritonitis or paralysis of the bowel. Either condition is well-nigh hopeless Reopening the abdomen and puncturing the bowel in a number of places, closing the puncture wounds afterward, is indicated for paralysis. Reopening the wound, irrigating the abdominal cavity, allowing the wound to gape, packing it with gauze, and draining Douglas's pouch with a tube are indicated for septic peritonitis.

Secondary or continued hemorrhage is one of the rarest complications following an abdominal section after the operator has acquired skill and experience It is due almost without exception to an error of technic or to unreliable ligature material If cumol gut is used as a ligature, the assistant who threads the needle with it should test each strand before he hands it to the operator, by traction and by jerking it. If the ligature material is sound and is not absorbed too quickly, the explanation of the hemorrhage is found in a faulty application of the ligature or an insecure knot. Catgut should invariably be tied in three knots. It is true that a tighter knot is tied with catgut, if the first is single and the next is a surgeon's knot, with another single knot on top of it, but there is danger of the ligature slipping if the first knot is single, before the second knot is tied, so that I prefer tying silk and catgut alike; first a surgeon's knot, then a single knot, and, in the case of catgut, another single knot.

Before closing the abdomen, a most careful search is made for bleeding and oozing points. A common source of bleeding after an operation is a slight injury to the free edge of the broad ligament above and to the outer side of the ligature around the ovarian artery. Omental and mesenteric adhesions stand next in frequency as sources of hemorrhage, and finally bleeding points not included in the ligatures of the six arteries of the broad ligaments may be found in the bottom of the pelvic cavity. This region should always be investigated if there is any oozing, by using broad retractors for the abdominal walls and having a nurse throw a powerful light into the bottom of the pelvis with a shaded hand electric light, while the patient is in the Trendelenburg posture.

If symptoms of internal hemorrhage appear after the abdomen is closed, they cannot be recognized too soon. In my experience [1] the signs of bleeding usually appear within six hours of the operation. In one case of hemorrhage from the puncture of a pedicle needle and a mass ligature many years ago (which could not occur if the ligature were properly placed and tied), the symptoms only became unmistakable after twenty-four hours; the abdomen was reopened and the broad ligament retied with a favorable result. The only treatment is to open the abdomen, wash out the blood, seek the bleeding point or area, and secure it with a ligature or ligatures, the patient receiving a submammary or intravenous injection of normal salt solution and stimulants hypodermatically before, during, and after the operation. Unfortunately, the secondary operation is not often successful. By the time it is obviously necessary, the patient is in poor condition to stand it.

It is often exceedingly puzzling to differentiate postoperative shock from hemorrhage. They have many symptoms in common, but in intra-abdominal hemorrhage the abdomen is eventually distended, there is not the leaking skin of shock, the temperature falls again after the primary reaction following the operation, there is steadily increasing pallor of the face, lips, and gums, the pulse steadily loses volume and becomes more compressible, rapid, and fluttering, and there is air hunger.

Leukocyte-count.—There is always a leukocytosis after an abdominal section, or any other surgical operation, rapidly subsiding if everything goes well, or recurring and persisting if there is a subsequent infection or inflammatory action. It is an interesting observation to note the proportion of leukocytes day by day after an operation, but there is so little practical utility in it that to the author's mind it is not worth the annoyance to the patient and the trouble to the hospital staff, as a routine practice. The pulse, temperature, distention of the abdomen, tenderness, localized exudate, the patient's condition and expression, are much more valuable guides to her condition.

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[1] The last case of secondary or continued hemorrhage in my services occurred more than six years ago. Up to that time the accident occured occasionally, at long intervals, more frequently at first than later.

Rest and Confinement to Bed.—The supine position must be maintained for three weeks. Rolling from side to side or any exertion may weaken the fascia or at least stretch the skin union and spoil the appearance of the wound. At the end of three weeks the patient begins to get up for short periods at a time. It should be, as a rule, four weeks before she goes out. A much shorter convalescence is possible, but not so advantageous to the patient, who, if she is hurried out, has a tedious and often unsatisfactory convalescence to complete at home.

The first dressing of the wound is made at the end of eight or ten days if the temperature remains normal; otherwise at the end of a week or less. Gowns and gloves are sterilized as for the operation. A probe, medicine dropper, scissors, and tissue forceps are boiled in an instrument pan. A bundle pinned in a towel, of two sheets, six towels, cotton and gauze, is sterilized in the autoclave. The strips of plaster are loosened with alcohol or benzine and are removed with the dressing by a nurse. The surgical dresser has prepared himself as though about to operate, and is protected by a long-sleeved gown and gloves. The abdomen is surrounded with four sterile towels, the silver foil and its paper covering are removed by tissue forceps or the fingers. A pledget of cotton soaked in sublimate solution, 1 : 2000, is laid over the wound. The surrounding skin is rubbed with alcohol on pledgets of sterile cotton. The wound is exposed. Any dried or clotted blood is carefully removed with tissue forceps. The loop of the subcuticular stitch is gently pulled upon. It is of fine catgut and usually comes off at its points of insertion and emergence in the skin. If not, the upper end is cut and it is pulled out from above downward The wound and surrounding skin are dried with a sterile towel or pledgets of gauze Gauze squares are laid over the wound and surrounding skin. The dressing is held in place by strips of yellow surgical plaster two inches wide and long enough to reach two-thirds around the abdomen made adhesive by heat, and an abdominal binder. The zinc oxid plaster can not be reapplied, as it sticks too tightly and irritates the skin.

The second dressing is made three or four days later by the operator or his dresser If the wound looks satisfactory and is permanently healed, subsequent dressings every third or fourth day may be made by the nurse.

If the wound is infected and there is subcutaneous suppuration, the end of a small surgeon's probe may be inserted in the middle of the infected area or at two points through the skin wound to allow a vent for the discharge Through these small pinhole openings the subcutaneous area may be irrigated by injecting peroxid of hydrogen, half strength, followed by weak permanganate solution (1 : 6000) with a medicine dropper. There must be a daily dressing By this plan a perfect appearance of the wound may be obtained in spite of infection

If the skin parts and the wound gapes, the raw surface is painted with a solution of nitrate of silver, 10 grs –f ʒj, a narrow strip of gauze is laid along the bottom of the wound, and the skin edges are drawn together as closely as possible with narrow strips of zinc oxid plaster. Five times in the last eighteen years the author has had the experience, startling at first, of seeing the whole wound break open and the intestines lying out on the abdomen under the dressings The accident occurred late,—after the tenth day—except in one instance. There was no fever or other disturbance of health except slight nausea The intestines were cleansed and put back in the abdomen, the wound was brought together by interrupted stitches of silver wire or silkworm-gut, and a strip of gauze was inserted to the peritoneum between two of the sutures In one or two cases no anesthesia was employed, in the others, a whiff or two of gas and ether were given All the women recovered, the wounds closed by granulation, but four had a hernia which was repaired by a subsequent operation In these cases the peritoneum and fascia part first, the skin holds for some days and then suddenly gives way. In one case it was known that the patient got out of bed; in another there was uncontrollable and violent hiccoughing for some days after the operation In a third—an operation for a gangrenous ovarian cyst after labor—there were extreme tympany and violent retching The other two were inexplicable. Two of the wounds had been closed layer by layer with catgut; three, a number of years ago, by close-set interrupted sutures of silkworm-gut

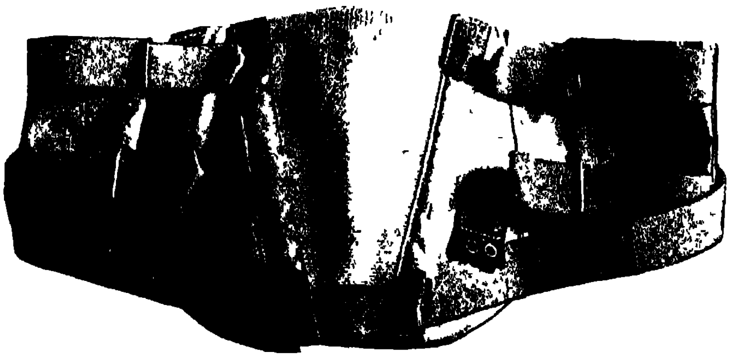

Fig 588 - Abdominal supporter

Abdominal Supporter.—It is good policy to recommend an abdominal binder to be worn for six months after an abdominal section. The integrity of the wound depends on the way it is sutured and the care of the patient afterward. A binder will not prevent a hernia if there is faulty junction of the fascia or the wound is strained in the patient's early convalescence; but it often gives comfort, especially in stout women with a tendency to pendulous abdomen, and in such women it does support the abdominal walls and lessens the strain on the cicatrix When the binder is relinquished it should be replaced for a time by a Jaeger wool bandage, which is gradually reduced by cutting strips off it Unless this precaution is observed a violent cold may be taken.

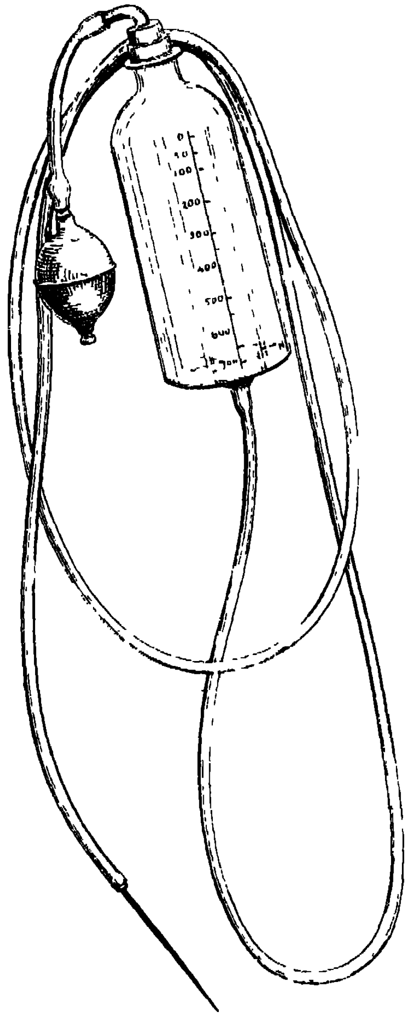

Fig. 589.—Apparatus for hypodermoclysis

The Treatment of Shock during and after an Abdominal Section.—The anesthetizer attends to the stimulation of the patient during the operation. A tray with a hypodermatic needle, strychnia, digitalis, and nitroglycerin is close at hand, in case it is needed If there is anemia, serious loss of blood before or during an abdominal operation, injections of normal salt solution are required It is a convenient plan to have in the operating room sterile flasks of the modified salt solution (Hare's formula) of double strength. By adding an equal quantity of hot sterile water, the solution is immediately ready for use. The needle for injection and the glass jar with rubber cork and bulb syringe attachment (Clark's apparatus), for increasing the air-pressure over the fluid, are sterilized by boiling and are kept always in one place, ready for instant use. They are prepared for every operation. In women the most convenient and quickest way to inject normal salt solution is under the breasts. The mammary gland is seized and lifted off the chest; a nurse cleanses a spot of skin with alcohol on the periphery of the base of the breast. The needle is inserted horizontally so it shall not penetrate the pleura (an accident I once saw), the air-pressure is increased over the fluid in the jar, which is held at a considerable height above the patient; the breast is kneaded and rubbed to hasten the absorption of the fluid under it. The puncture wound is closed with collodion and cotton after the needle is withdrawn. There is no question that a patient responds more quickly to intravenous than to submammary injections, but it requires time and is not always easy to cut down upon the median basilic vein, to insert the needle into it, and to place a ligature around the needle in the vein and another one below it. It is quite frequently possible, however, to grasp the arm above the elbow, to make the vein stand out under the skin, to cleanse the skin over it with alcohol, and to insert the needle directly into the vein through the skin.

Normal salt injections may be required after the patient is placed in bed. They are never harmful and often do the greatest good. An injection every twelve or eight hours, of a pint under each breast, is the usual routine order. In the most serious cases 10 minims of the 1 . 1000 adrenalin solution should be added to each pint of normal salt solution. In addition, artificial heat is continued until reaction is established; a hypodermatic injection of digitalis (♏x) and strychnia sulphate (gr $\frac{1}{20}$) is ordered every four hours. Alternating with the hypodermatic injections, an enema is injected of one ounce of predigested beef, four ounces of normal salt solution, carbonate of ammonia, gr xx, and whisky, f℥ss Nitroglycerin ($\frac{1}{100}$ gr) and inhalations of oxygen are reserved for emergencies. The stimulation is naturally reduced as the patient's condition improves.

Sequelæ of Abdominal Surgery.—Abdominal Hernia.—In the days when it was customary to unite the abdominal wound by interrupted sutures, it was commonly acknowledged that a hernia must be expected in about 10 per cent of the cases. Since the development of a better technic, closure of the wound, layer by layer, with durable catgut, the proportion of herniæ is not one-tenth what it was. They ought really to be unknown if the suture material is perfectly reliable in tensile strength and durability, if the woman's tissues are fairly healthy, if no unusual strain is imposed upon the wound, and if the patient is confined to bed long enough; but as there is always a possible fault in one of these particulars, a hernia after an abdominal section is not yet absolutely avoidable. Fortunately the technic of their permanent cure by surgical means has advanced *pari passu* with the improved technic of closing the abdominal wound, so that no one need suffer from the discomfort and dangers of an abdominal hernia following an operation who will submit to the necessary treatment

A long abdominal incision is made extending above to the umbilicus, below to the symphysis, and encircling the hernial pouch. The skin of the latter is nicked with a knife, with care

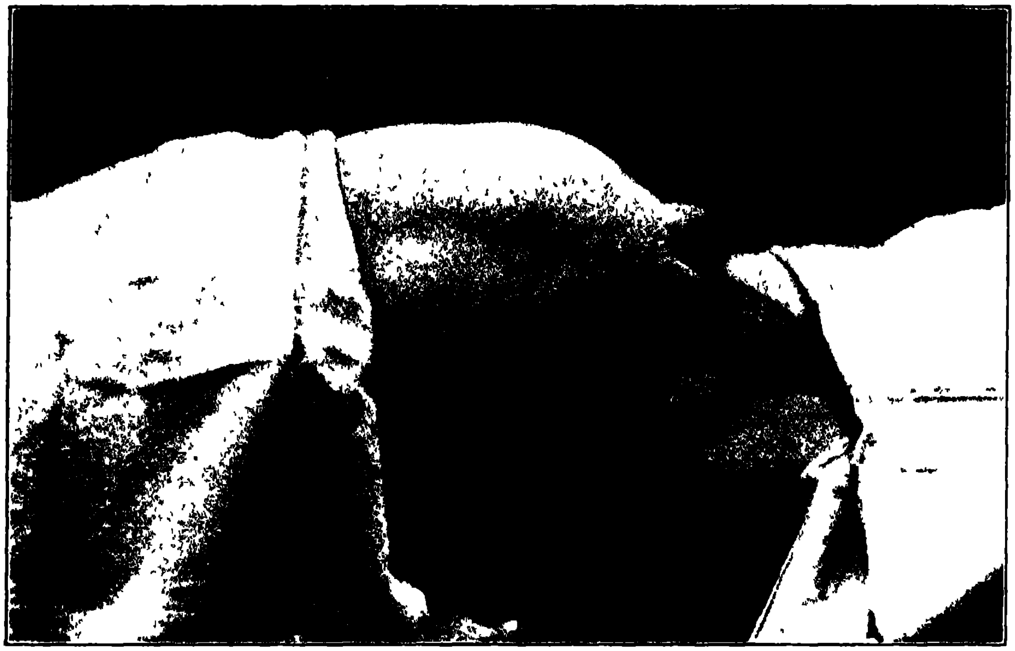

Fig. 590.—Umbilical hernia

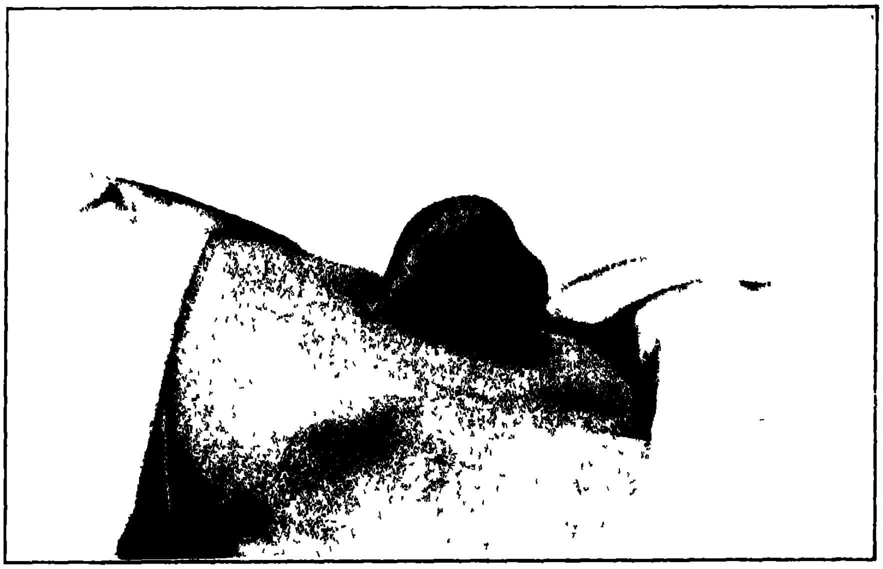

Fig 591 —Hernia in the scar of an abdominal section.

not to injure the intestinal loops in it. The whole sac is laid open. Intestinal and omental adhesions are severed and the contents of the sac are returned within the abdomen. The whole sac is excised. The skin and fat above and below it are dissected back till both recti muscles are exposed the whole length of the wound. The tissues matted together around the hernial ring are separated by a flap-splitting dissection. The sheaths of the recti muscles are split the whole length of the wound. The abdominal opening is closed by uniting the peritoneum and superimposed fascia. Four to six mattress sutures are inserted through the outer edges of the sheaths of both recti, skipping the tissues between. Silkworm-gut sutures are inserted through the skin, fat, and outer edges of the sheaths of the recti muscles. The mattress sutures are tied; the outer edges of the recti sheaths are united with formalin catgut (No. 3) in a continuous suture. The fat is united by a double tier running stitch of fine catgut. The skin is united with a continuous suture of catgut and the interrupted silkworm-gut sutures are tied. If the

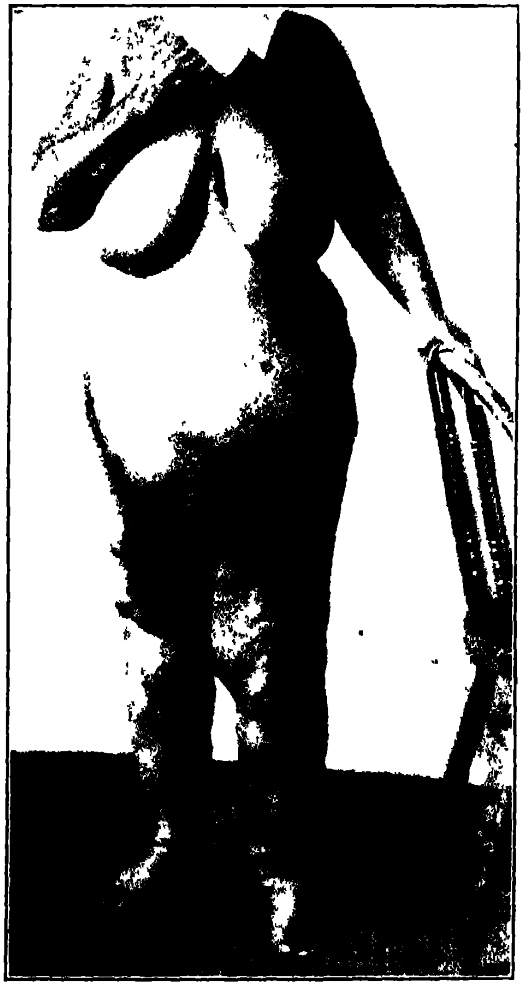

Fig 502 —Degeneration of the abdominal walls with multiple herniæ.

structures of the abdominal wall are fairly healthy, this technic promises a permanently good result.

There is occasionally a curious degeneration of the abdominal wall, making it incapable of adequately supporting the intra-abdominal contents. The closure of a hernia in one place is followed by the development of others almost immediately.

A sinus following abdominal section is rare if permanent suture material is avoided in cases of infectious or inflammatory processes, especially in those requiring drainage. Permanent sutures to suspend the uterus and permanent sutures to unite the fascia in the abdominal wall are particularly liable to excite irritation and suppuration and so to develop a sinus. I have removed silkworm-gut and silver wire sutures from the fascia inserted by other operators. In one case a woman developed an abscess around two silk sutures in the fundus uteri a year after the operation, and in another seven years after the insertion of two silkworm-gut sutures to suspend the uterus. In both cases it was necessary to reopen the wound to the fundus uteri and to remove the sutures.[1] If the knots of the suspension sutures are tied inside the peritoneal cavity (page 290, Fig. 302), it is not likely that a sinus will develop even in the remote future. A sinus dependent upon permanent suture or ligature material will not heal till the silk or silkworm-gut has been removed. It usually comes away spontaneously after some months, but can often be extracted. I have found nothing so good for this purpose as a surgeon's probe, seized at its point in a hemostat and bent into a right-angled hook With this implement, patient fishing at the bottom of the sinus is often rewarded by the extraction of the foreign body

If there is no foreign body at the bottom of the sinus to keep it open, such as a slough or ligature material, a dressing of alcohol and water, equal parts, on gauze, often hastens its closure

Fecal Fistula.—If the bowel is perforated when the abdomen is opened by a pelvic or abdominal abscess which has discharged through the intestines; if the walls of the bowel are infiltrated and unhealthy, and are subjected to pressure in subsequent drainage of the pelvis; if an intestinal anastomosis has been attempted and has partially failed; if the bowel coats are much injured in the separation of adhesions and can not be perfectly repaired, a fecal fistula may result through the abdominal incision. In the majority of cases the fistula closes spontaneously in a few days [1] or at most a few weeks. If permanent ligatures have been used, they must be extracted; if not, the case should be treated expectantly for nine or twelve months, as the sinus often closes gradually in that space of time. The abdomen is protected by a pad of gauze held in place with adhesive strips, the dressing being frequently changed. If the fistula does not close in a year, it will probably never heal spontaneously, and the patient is exposed to considerable risk of abscess-formation, obstruction of the bowel, or pyemia. I have seen a woman die from these causes as late as four years after the establishment of a fecal fistula. Operative treatment, therefore, should be proposed after a year or before that time if aggravated symptoms appear.

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[1] The original operations had been performed by other surgeons. I could not learn whether the sutures had been knotted within the peritoneal cavity.

The most successful operative treatment is to reopen the abdomen, protecting the external orifice with a pledget of cotton soaked in sublimate solution, 1:1000, to dissect out the sinus, which is usually a tubular canal, with walls of organized exudate, about the caliber of a little finger, down to the opening in the bowel, to enlarge the latter by clipping away its infiltrated edges, and to close it with a double row of mattress sutures, unless this plan narrows the caliber of the bowel too much. In such a case an end-to-end anastomosis of the bowel is indicated, the portion containing the fistulous opening being excised. I find the O'Hara forceps the best instrument for the purpose, and had instinctively used this principle with ordinary Péan forceps before the O'Hara instrument was invented.

Femoral Thrombophlebitis.—In 0.3 to 3 per cent. of abdominal sections there is a postoperative femoral thrombophlebitis, most often on the left side The etiology of the condition is obscure. It is often due to a mild form of infection, as is demonstrated by the following facts. The better the aseptic technic, the smaller is the proportion of phlebitis, [2] an operator may have a very unusual proportion of cases for a period of some months and not again for years; [3] there is usually elevated temperature and at least a slight acceleration of pulse. Infection, however, is not the sole explanation. It is commonest after suspension of the uterus and hysterectomy, and not after operations for suppurative conditions in the pelvis, it occurs late, after the eighth day, and is practically never fatal. Clark [1] explains it by a primary thrombosis of the epigastric veins due to pressure from abdominal retractors or to inclusion in the adhesions or sutures of a uterine suspension. The clot extends from these veins into the femoral, usually the left, in which there is greater predisposition to thrombosis on account of the greater length of the left common iliac vein, its passage under the artery, and the pressure to which it is subjected by the sigmoid flexure.

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[1] In one of my cases a perforation of the rectum was found, in an operation for pelvic abscess, large enough to admit a thumb The pelvis was drained, without attempting to close the hole in the bowel, the fecal fistula closed within a week; the wound was perfectly healed in three.

[2] In the author's last 300 abdominal sections there has only been one case of phlebitis, in an operation for carcinoma of both ovaries and the uterus, complicated by tubercular peritonitis.

[3] Dr Whitridge Williams told me that during one winter almost every case he operated upon developed phlebitis.

The most reasonable explanation is found in a combination of factors: A mild infection of the branches of the epigastric veins in the abdominal walls or of the vein of the round ligament emptying into the epigastric; a pressure thrombosis in these veins from instruments or ligatures; the prolonged retention of the patient in the supine position with the legs rigidly extended; and the pressure upon the groins by the lower edge of the abdominal dressings, the last two factors exerting pressure upon the femoral veins themselves and predisposing to thrombosis, especially on the left side.

The first *symptoms* are pain in the calf of the leg and in the groin, with a moderate rise of temperature and slight acceleration of the pulse, though the systemic symptoms may be scarcely noticeable. The leg rapidly swells, becomes milk-white in color, and pits on pressure

The *treatment* is elevation of the limb on pillows, its envelopment in cotton and a lightly applied bandage to mitigate the feeling of numbness and cold in it; an application of unguentum Credé (soluble silver) along the course of the femoral vein, and absolute quiet, with avoidance of all physical effort or disturbance.

The symptoms subside slowly Plenty of time should be allowed for the liquefaction of the thrombus or its firm organization, before permitting the patient to get up, else there may be a cardiac or pulmonary embolus, with a fatal result.

The After-treatment of a Plastic Operation.—The gauze packing is removed from the vagina at the end of twenty-four hours. It should be one of the most stringent rules of a hospital service that the nurse in charge of the patient must attend to this duty. The author has seen one case dangerously infected by a vaginal tampon which had been inserted in another hospital, had been forgotten, and with which the patient entered the author's wards in the Philadelphia Hospital some four weeks after her operation. In one of the maternity hospitals of Philadelphia an intra-uterine packing for hemorrhage was forgotten. The patient died ten days later, when the gauze, in a horribly fetid condition, was discovered in the uterine cavity. If more than one strip of gauze has been inserted, the fact must be entered on the patient's chart before she leaves the operating room.

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[1] "Univ of Penna. Med Bulletin," 1902.

Catheterization should be avoided, if possible. It is not necessary to protect the wound, which is guarded in the vagina by the packing for the first twenty-four hours and which is cleansed on the external genitalia by pouring sterile water over it from a pitcher while the patient is on a bedpan after each urination. If it is necessary to catheterize the patient, the nurse wears sterile rubber gloves; the patient's thighs are well separated; the labia are separated by the thumb and forefinger of one hand; the vestibule is cleansed with a pledget of cotton and sublimate solution; the sterile catheter is taken from the pan in which it has been boiled, is dipped in a medicine glass containing sterile castor oil, and inserted directly into the external meatus without touching surrounding tissues. If but one or two catheterizations are required, the short glass catheter is most convenient. If the catheter must be used for a considerable time, the soft-rubber catheter is preferable, as it does not irritate the urethra.

The vulva is cleansed and protected by irrigations with sterile water after each urination; by dusting with xeroform twice or three times a day, and by a wide and thick vulvar pad of sterile cotton and gauze held by a T-binder.

If there is **secondary hemorrhage** after a plastic operation, the bleeding can always be controlled by placing the woman on the operating table, removing the original packing and douching the vagina, repacking it as tightly as possible without straining the stitches, by inserting a narrow-bladed Sims' speculum to distend the vaginal introitus, placing a large mass of gauze over the vulva, and applying a tight T-binder.

Douches routinely after a plastic operation are a disadvantage. About the fifth or sixth day a sterile water vaginal douche is given. After that, if there are no discharge and no discomfort, a douche of sterile water every other day is sufficient

The bowels are moved by a half bottle of citrate of magnesia on the evening of the second day, the rest of the bottle the next morning before breakfast, followed, if necessary, by an enema later in the day.

Removal of Stitches.—The author removes stitches himself from both ward and private patients. To save time and trouble, they are all taken out on the fourteenth day. The perineal sutures may be removed earlier, as they have a tendency to cut into the skin, but it disturbs the patient to remove sutures twice within a few days and it increases the work of the operator. The number of sutures inserted is invariably noted upon the patient's chart before she leaves the operating room. Her chart is brought with her to the operating room when the stitches are removed.

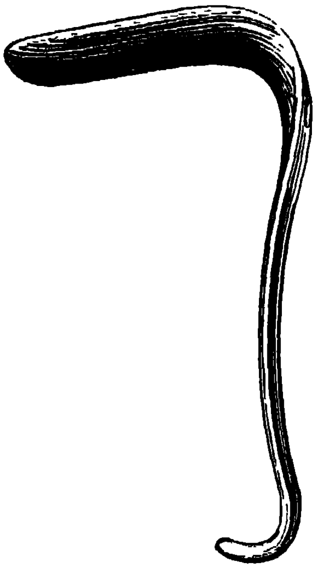
Fig. 593.—Narrow-bladed vaginal retractor

The patient is put on the table in the dorsal position with her legs and feet supported on uprights and stirrups as though for a plastic operation. The vaginal sutures are displayed by a very narrow-bladed retractor on the model of a Sims' speculum. The ends have been left an inch long above the shot; they are seized with a hemostat, one blade of a sharp-pointed scissors is inserted below the shot between the strands, one strand is cut, and the suture pulled out. If there are cervical sutures they are removed first by inserting a narrow-bladed bivalve speculum, virginal size, distending its blades moderately and illuminating the vagina by an electric head-light. Specially constructed scissors and forceps, enabling the operator to keep his hands from obstructing the light, are a great convenience. The author does not like the plan of bunching a number of suture ends together and clamping them with a large shot. It makes a thick rope of stitches on

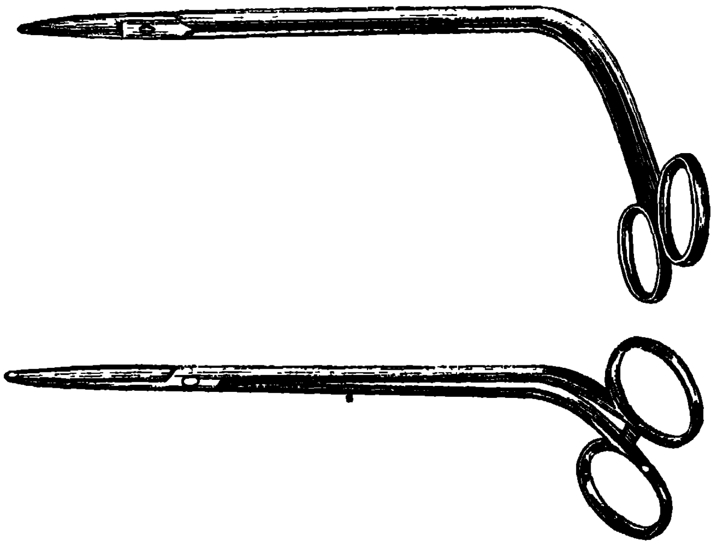
Fig. 594.—Forceps and scissors for removing cervical stitches.

which discharge collects, and is not so cleanly as leaving the individual suture ends loose and about an inch long.

Confinement to Bed.—The day after the sutures are removed the patient begins to sit up in bed. She gets out of bed three days later and leaves her room or goes home as soon as she feels able. Coitus should be interdicted for at least six weeks after a plastic operation in the genital canal. If the vaginal introitus has been too much narrowed, by an operation for rectocele, or prolapse, Hegar's graduated bougies, used for vaginismus, obviate the difficulty.

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